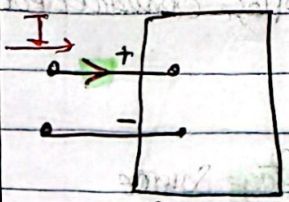
Malek Zeghari

ENEE 2304
Circuit
Chapter 1:-

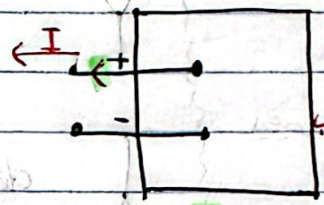
- Voltage V , current A , Power W , energy J

* passive Sign convention :

$P = VI$ or $P = -VI$

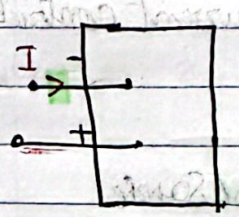


$P = VI$

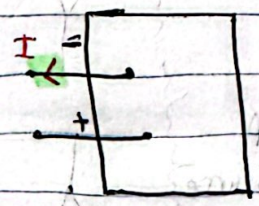


$P = -VI$

* اذا كان التيار داخل + ← القانون موجب
أما اذا كان داخل على السالب ← القانون سالب
* اذا كان التيار جاي من + ← القانون سالب
أما اذا كان جاي من − ← القانون موجب



$P = -VI$



$P = VI$

* if $P > 0$ (positive) (find value for example 10 w)

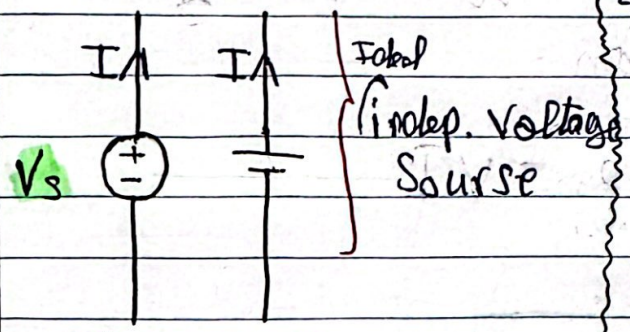
→ the element is absorbing the power. (needed power)

* if $P < 0$ (negative) (- 10 w)

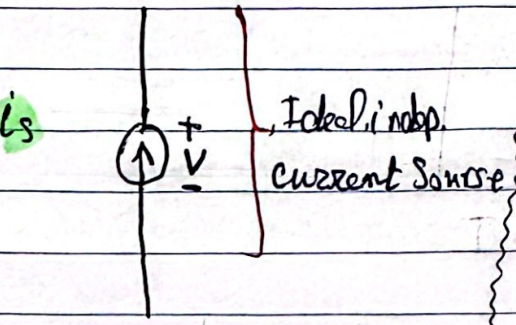
→ the element is delivering Power. (gave power)

Chapter 2: Voltage and current Sources.

independent



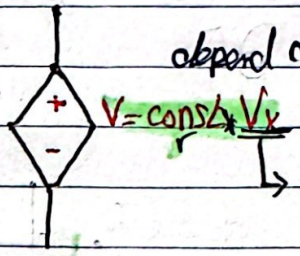
V → const
I → depends on the circuit connection (load)
(changed)

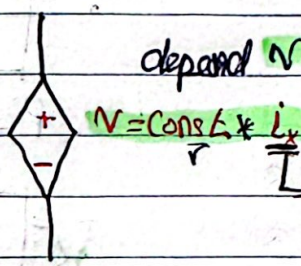


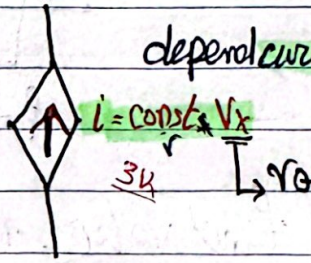
I → const.
V → depends on the circuit connection
(changed)

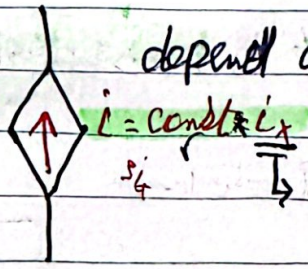
dependent

↳ its value depends on Voltage / current somewhere in the circuit.

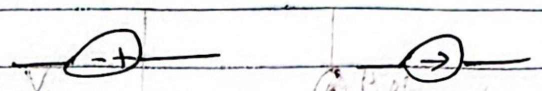




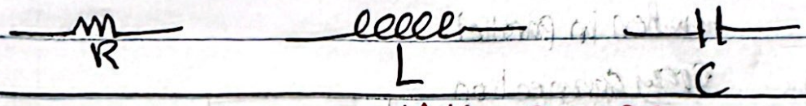




active elements → produce energy



passive elements → consume energy.



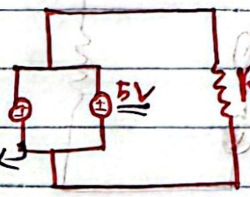
X → invalid
✓ → valid

Voltage Sourse

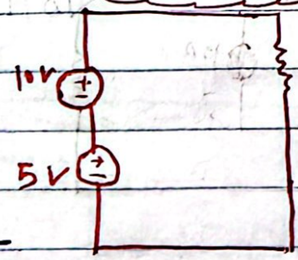
Exp:

الأفرع مختلفة 10V 5V

إذا بدنا نربطها بشكل موازي لازم متساوية

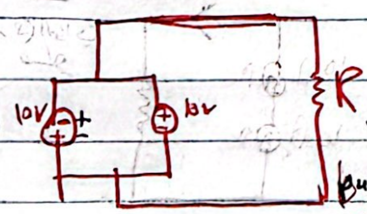


X
→ they connected in parallel → V must be equall

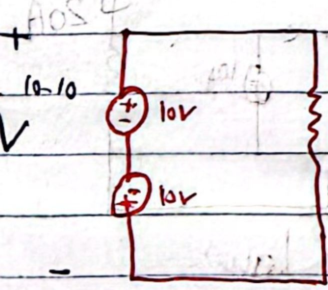


✓

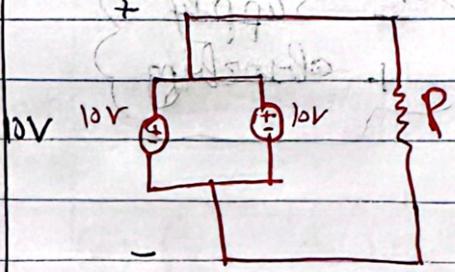
lazem اتجاه الموجب والسالب تكون نفس



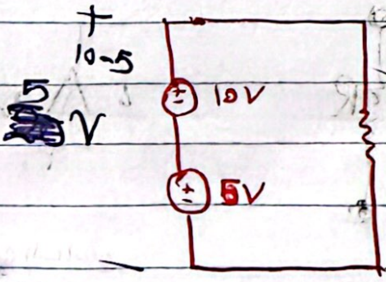
invalid
X
→ they are equall in Voltage but have different polarity (10 V, -10V)



✓



valid ✓



✓

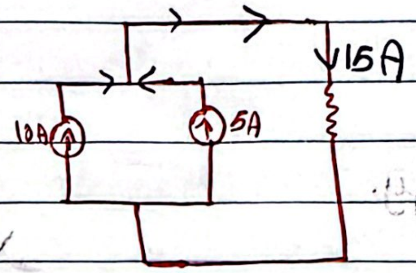
* when in series any connection is valid.

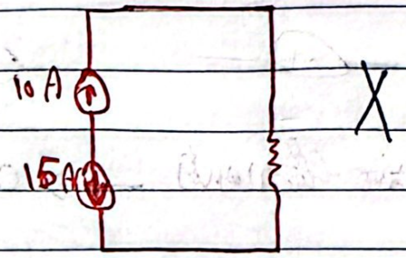
لاحظ قوانين كيرتشوف ، التيار في التوالي متساوي ، توازي غير متساوي

و الجهد في التوالي غير متساوي ، في التوازي متساوي.

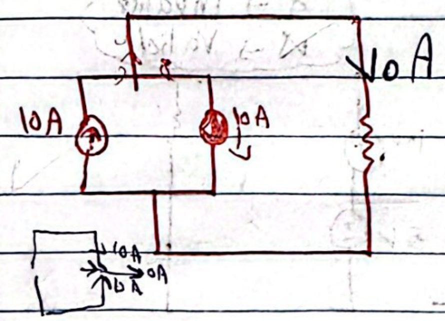
Current Source:

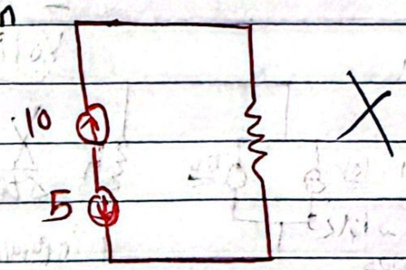
Exp:-

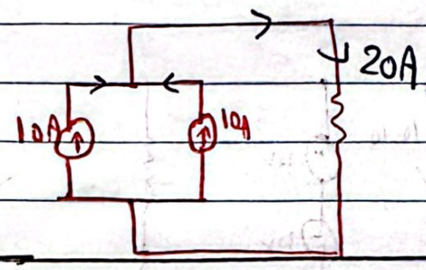




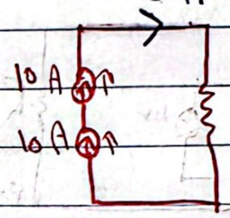
* when in parallel every connection is valid







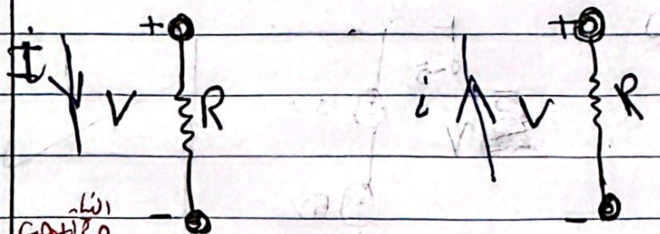
20A not 20



Ohm's Law:-

- supply

\+ absorbing



التيار من الموجب

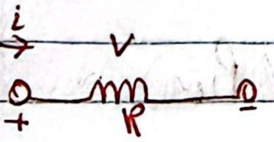
التيار من السالب

$V_s + IR$ (+ve) $\quad\quad V_s - IR$ (+ve)

$P = IV \quad\quad P_s = VI$ (+ve)

R: بالموجب +ve $\quad\quad P$ +ve

①



$P = VI$ داخل على الموجب

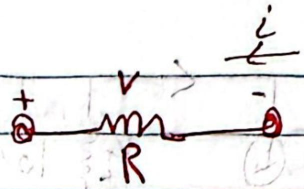
$= (IR)\, I$ داخل على الموجب

$= I^2 R$ +ve

or $P = VI$

$= V\left(\frac{V}{R}\right)$

$= \frac{V^2}{R}$ +ve



$P = \ominus VI$ داخل على السالب

$= -(-IR)\, I$ داخل على السالب

$= I^2 R$ +ve

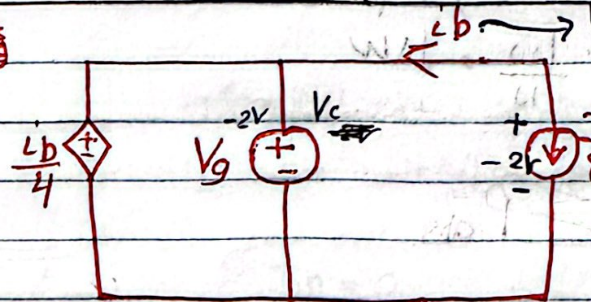
or

$P = -VI$

$= -V\left(\frac{-V}{R}\right)$

$= \frac{V^2}{R}$ +ve

Ex 2.1
P.52



$P = -i_b V = -(-8)(-2) = -16W$

$P = -IV = -(2)(8) = -16W$

* Find ① Vg interconnection to be valid.

② P_{8A}

① $i_b = -8A$

$\frac{i_b}{4} = \frac{-8}{4} = -2$ volt

لحد التوصيل توازي وإعطيها من الموجب

$V_g = -2V$

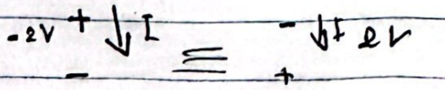
داخل على الموجب

② $P_{8A} = \ominus V i_8$

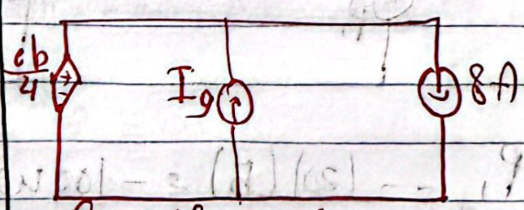
or $= IV$

$= (-2)(8)$

$= -16W$ (supply)



نفس الدوال



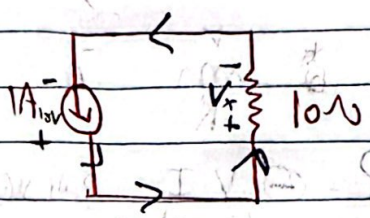
find the value of Ig.

Any value is valid.

في حالة التوازي

لو توالي لازم نفس الاتجاه والقيمة

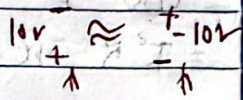
Exp 2.3



Find $P_{10\Omega}$:

$P = IV_R \rightarrow V = IR$

$= (1)(10) = 10$ volt.



$P = I(10) = 10W$

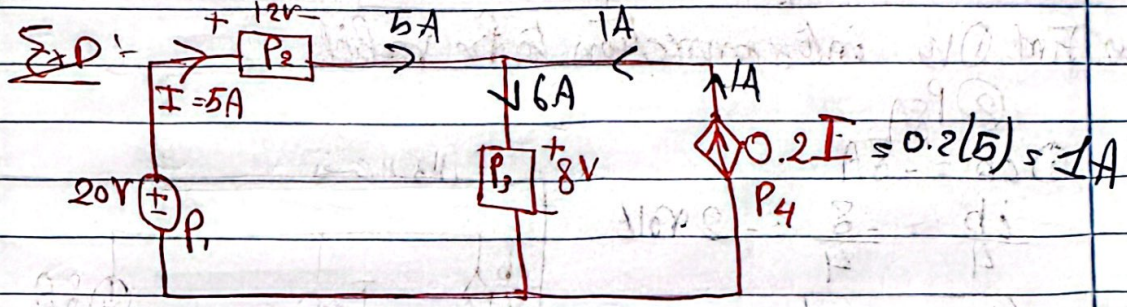
or $P = I^2R = (1)^2(10) = 10W$

or $P = \frac{V^2}{R} = \frac{100}{10} = 10W$

$\sum P(t) = 0$

$\sum P_{sup} = \sum P_{abs}$

Exp:



$P_1 = -(20)(5) = -100W$ (supply)

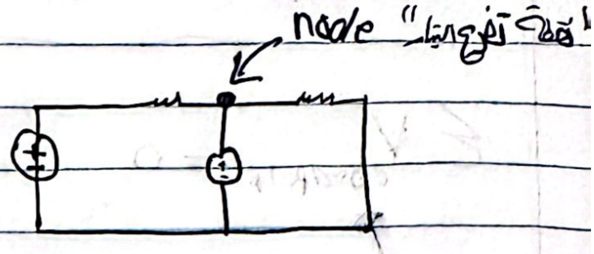
$P_2 = (12)(5) = 60W$ (abs.)

$P_3 = (6)(8) = 48W$ (abs.)

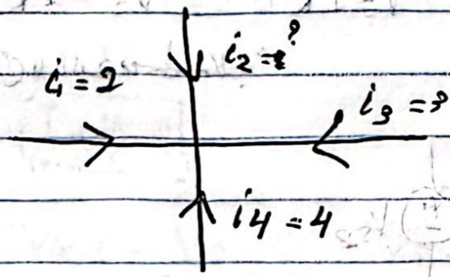
$P_4 = -8W$ (supply)

or $-(8)(1) = -8W$

* Kirchhoff's current law: "KCL"



* $\sum I_{in} = \sum I_{out}$



find i_2?

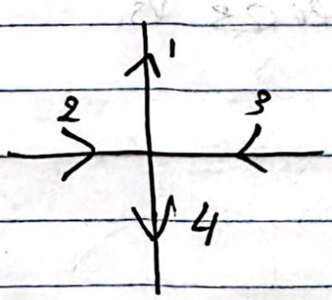
$\sum I_{in} = \sum I_{out}$

$2 + 3 = 4 + i_2 \rightarrow i_2 = 1A$

another ways to use the law:-

* $\sum I_{in} = 0$

← التيار إلي فعلاً داخل بنحطه بإشارة + و بنحط التيار المعاكس (الطالع) بنحطه بإشارة -



$\sum I_{in} = 0$

$= 2 + 3 + \underbrace{-4 + -1}_{} = 0$

معاكسين لاتجاه الدخول

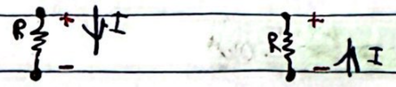
$\sum I_{out} = 0$ ← التيار إلي طالع ← بإشارة موجب (+) و التيار المعاكس (الداخل) بإشارة سالب (−)

$\sum I_{out} = 1 + 4 + \underbrace{-2 + -3}_{} = 0$

معاكسين لاتجاه الخروج

* Kirchhoff's voltage law :- "KVL".

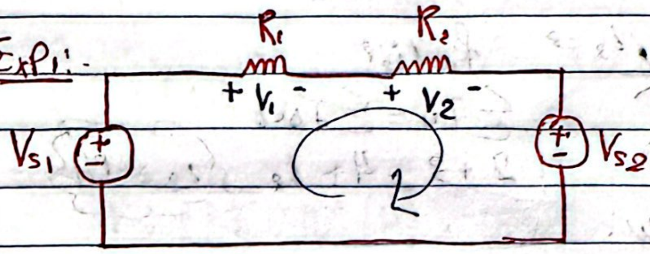
$\Sigma V_{closed\,path} = 0$



$V = IR$ $\qquad$ $V = -IR$

"التيار داخل من الموجب يعطي سالب"

Exp 1 :-

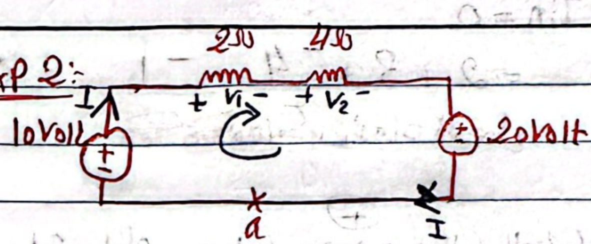


$\Sigma V_{\circlearrowleft} = V_1 + V_2 + V_{S_2} - V_{S_1}$

" V_{S_1} في عكس المسار الجهد في الدارة بينما باقي العناصر تنازل V "

$= -V_{S_1} + iR_1 + iR_2 + V_{S_2} = 0$

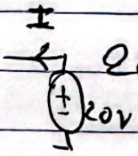
Exp 2 :-



$\Sigma V_{aa} = 0 \rightarrow -10 + V_1 + V_2 + 20 = 0$

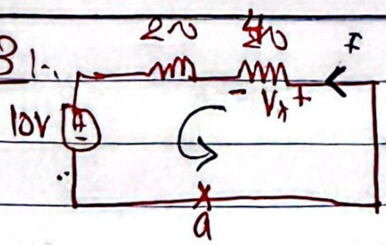
$-10 + 2I + 4I + 20 = 0$

$6I = -10 \rightarrow \boxed{I = -\frac{6}{10}}$



20v عكس الجهد بالمسار

Exp 3 :-



V_x ??

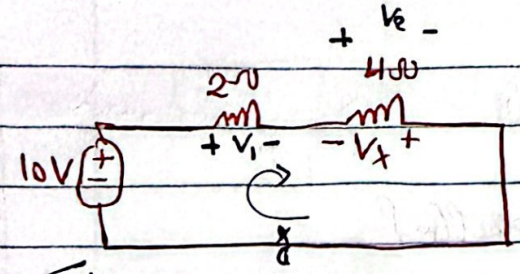
ΣV_{aa}

$\rightarrow 4I + 2I + 10 = 0$

$\boxed{I = \frac{-10}{6} A}$

$V_x = 4I$

$= 4\left(\frac{-10}{6}\right) = \boxed{\frac{-40}{6} \text{ Volt}}$



$V_e = -V_x$

$\Sigma V_{KVL} = 0$

$\Rightarrow V_1 + V_2 - 10 = 0$, $V_x = -V_2$

$2I + 4I - 10 = 0$ $= -IR_2$

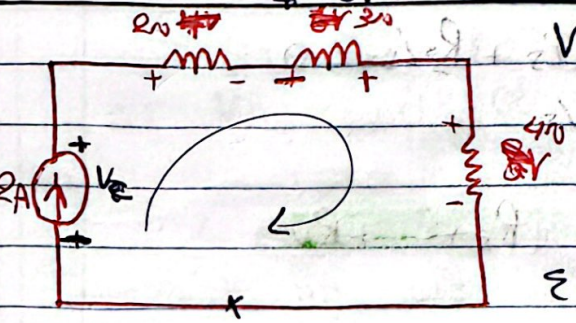
$\boxed{I = \frac{10}{6} A}$ $= -\left(\frac{10}{6}\right)(4) = \boxed{\frac{-40}{6} \text{ Volt}}$

or $V_x = -V_2$, $V_2 = IR$

$= \boxed{\frac{-40}{6} \text{ Volt}}$ $= \frac{10}{6}(4) = \boxed{\frac{-40}{6} \text{ Volt}}$

$\rightarrow 2I - V_x - 10 = 0$

$-10 + 2I - (-4I) = 0 \rightarrow -10 + 2I + 4I = 0$ ...



$V_1 = IR \rightarrow 4V$, $V_2 = 6V$, $V_3 = 8V$

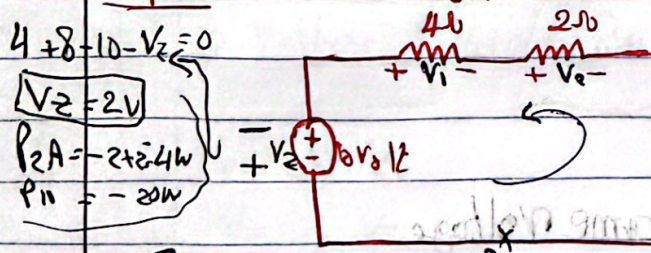
$V_2 + 4 + 6 + 8 = 0$ $V_2 = -6$

$V_2 = -18V$

ΣV_{abc} , $V_1 - V_2 + V_3 - V_e = 0$

$= 4 - -6 + 8 - V_e = 0 \rightarrow V_e = 18 V.$

Exp 4:- find V_1, V_e ? find V_1, V_2 ?



$4 + 8 + 10 - V_2 = 0$

$V_2 = 22V$

$P_{2A} = -2 \times 24W$

$P_{10} = -20W$

ΣV_{abc} , $= -V_2 - V_1 + 10 - V_c$

$= -(-2(2)) - (-4(2)) + 10 - V_c \rightarrow V_e = 22 V.$

-4 -8

$P_2 = -IV_e$ P_1

$= -2(-4) = 8W$ $P_1 = -IV_1$, $P_{10} = IV = 20W$

$= -2(-8) = 16W$ $= 20W$

$V_1 = -4(2) = -8$

$V_2 = -2(2) = -4$