قوانين مهمة :-

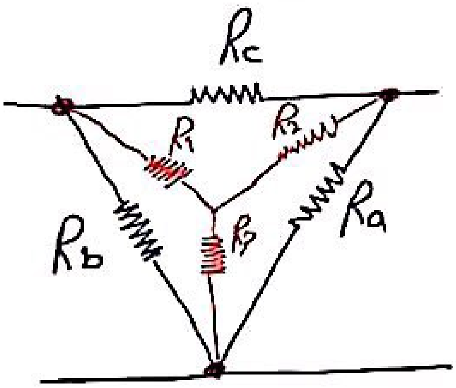
1

Voltage div. = $v_1 = \dfrac{R_1}{R_1+R_2+\cdots+R_N} * v_s$

Current div. = $i_1 = \dfrac{1/R_1}{1/R_1+1/R_2+\cdots+1/R_n} * i_s$ (Case I)

$$\left.\begin{aligned} = i_1 &= \frac{R_2}{R_1+R_2}\, i_s \\ i_2 &= \frac{R_1}{R_1+R_2}\, i_s \end{aligned}\right\}$$ (Case II: 2-Resistors in parallel.

delta to wye :-

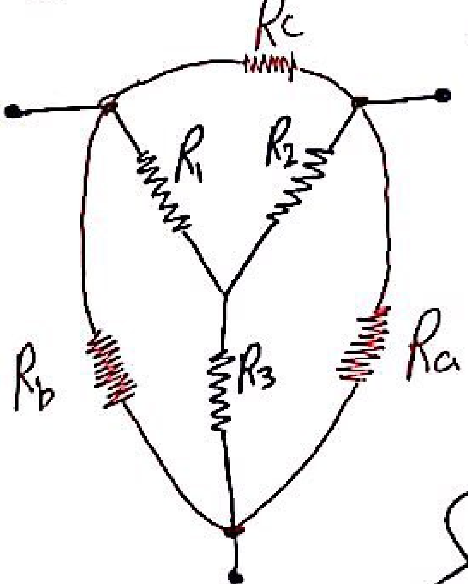


$$\Rightarrow R_1 = \frac{R_b R_c}{R_a+R_b+R_c}$$

$$R_2 = \frac{R_c R_a}{R_a+R_b+R_c}$$

$$R_3 = \frac{R_a R_b}{R_a+R_b+R_c}$$

wye to delta :-



$$\Rightarrow R_a = \frac{R_1R_2+R_2R_3+R_1R_3}{R_1}$$

$$R_b = \frac{R_1R_2+R_2R_3+R_3R_1}{R_2}$$

$$R_c = \frac{R_1R_2+R_2R_3+R_3R_1}{R_3}$$

$$R_\Delta = 3R_y$$

$$R_y = \frac{R_\Delta}{3}$$

Max. Power. trans in Thevenin equi.

$$= \frac{V_{th}^2}{4R_{th}}$$

Max. Power. trans in Norton equi.

$$= \frac{i_N^2 R_N}{4}$$

$C = \frac{\varepsilon_0 A}{d}$ (Parallel plate Capacitor).

$V\uparrow, q\uparrow$
$V\downarrow, q\downarrow$

$q(t) = CV(t)$

Capacitors behave like an open circuit in DC circuits.

$i(t) = C\frac{dv}{dt}$

$V(t) = \frac{1}{C}\int_{t_0}^{t} i(t)\,d\tau + V(t_0)$, # $V(t_0) = \frac{q(t_0)}{C}$

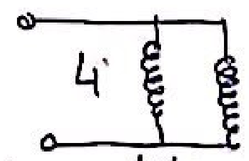
$w_c(t) = \frac{1}{2}CV^2(t)$

$w_c(t) = \frac{q^2(t)}{2C}$

Parallel inductors:- $\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + \cdots + \frac{1}{L_N}$

Series inductors: $L_{eq} = L_1 + L_2 + \cdots + L_N$

special case



$L_{eq} = \frac{L_1 L_2}{L_1 + L_2}$.

$V(t) = L\frac{di}{dt}$

$i(t) = \frac{1}{L}\int_{t_0}^{t} V(t)\,d\tau + i(t_0)$

$w_L(t) = \frac{1}{2}Li^2(t)$. # $L = \frac{N^2 \mu A}{l}$

$L\frac{di}{dt} + iR = 0$

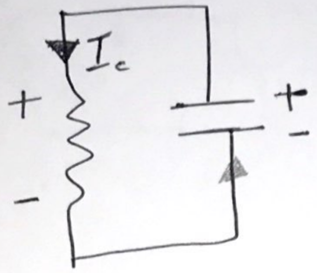
$y - y_1 = m(x - x_1)$ معادلة خط مستقيم #

$m = \Delta y/\Delta x$ ميل #

CH 7 : first order circuits

$$\boxed{W_C = \frac{1}{2} C V_0^2}$$

① source free RC - circuit.



$$\boxed{V(t) = V_0(t)\, e^{-t/\tau}}$$

$\boxed{\tau = RC}$ ⇒ after switches takes action.

* discharging in opposite direction.

* DC - conditions ⇒ capacitor : O.C

$I_c = C \frac{dv}{dt}$

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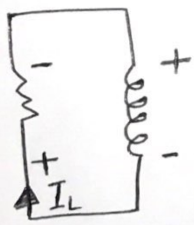
② Source free RL - circuit.



$$\boxed{I(t) = I_0(t)\, e^{-t/\tau}}$$

$\boxed{\tau = \frac{L}{R}}$ o R $\boxed{\frac{L}{R_{th}}}$

* Discharging in the same direction.

* DC - conditions ⇒ Inductor S.C

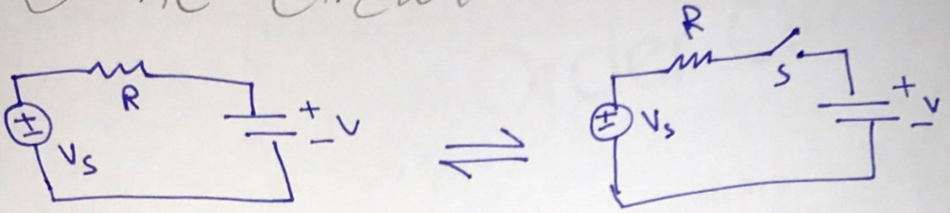
$V_L = L \frac{di}{dt}$.

$$\boxed{W_L = \frac{1}{2} L I_0^2}$$

* وجود dependent source يعني ال سيركت source free.

③ # step response #

Ⓐ RC-circuit.



$$V_{(t)} = V_\infty + [V_0 - V_\infty]\, e^{-t/\tau}$$

V_0 : initial voltage → Before the switch takes action.

كما أعرفها ← $\tau = RC$

بحذف ال source V_∞ : voltage after long time. → after the switch takes action.

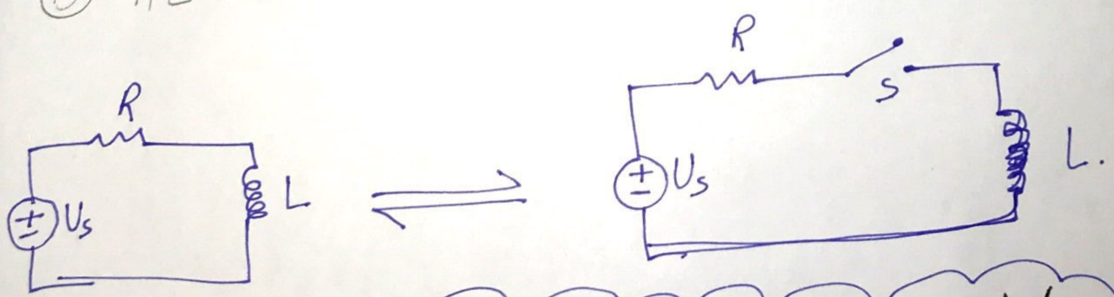
$C \rightarrow$ O.C

$I \rightarrow$ S.C.

*Tip Ⓐ $V = V_0 e^{-t/\tau}$

if the switch opened or closed at $t = 0$.

Ⓑ RL-circuit.



$$I_{(t)} = I_\infty + [I_0 - I_\infty]\, e^{-t/\tau}$$

*Tip Ⓑ

$V = V_0 e^{-(t-k)/\tau}$

if the switch opened or closed at $t = k$.

I_0 : Initial current.

$\tau = \frac{L}{R}$

I_∞ : current after along time. (I inductor ⇒ S.C.)

Capacitors (المواسعات)

$$\boxed{q = CV}$$

$$\boxed{I = C\frac{dv}{dt}}$$

$$\boxed{W = \frac{1}{2}CV^2}$$

$$v(t) = \frac{1}{C}\int_{t_0}^{t} I(\tau)\,d\tau + V(t_0)$$

series → $C_{eq} = \left(\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_N}\right)^{-1}$

parrallel → $C_{eq} = C_1 + C_2 + C_N$

اذا كان ال I,V $\boxed{DC}$ معناته ال

$\frac{dv}{dt} = 0$

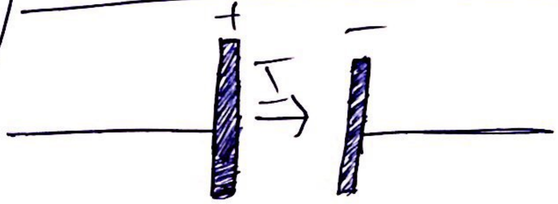
~~current~~ التيار بالمكثف = 0

في دارات ال DC نحط مكان المواسع o.c (open, circuit).

I=0 عشان نقطع ال Voltage.

معادلة الخط → $y - y_1 = m(x - x_1)$.

$m = \frac{\Delta y}{\Delta x}$



Inductors محث

$$L = \frac{N^2 \mu_0 A}{l}$$

$$V_L = L\frac{di}{dt}$$

$$W = \frac{1}{2}LI^2$$

$$I(t) = \int_{t_0}^{t} v(\tau)\,d\tau + I(t_0).$$

series → $L_{eq} = L_1 + L_2 + L_N$.

parrall → $L_{eq} = \left(\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_N}\right)^{-1}$

* اذا كان I, V $\boxed{DC}$ معناته

ال emf بالمحث يساوي صفر .

$\frac{dI}{dt} = 0$

في دارات ال DC نحط مكان المحث S.C (short.circuit)

V=0 عشان نطلع I.