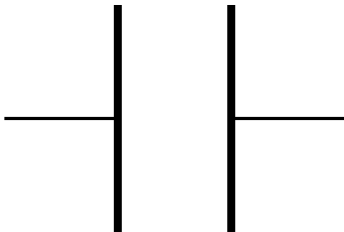


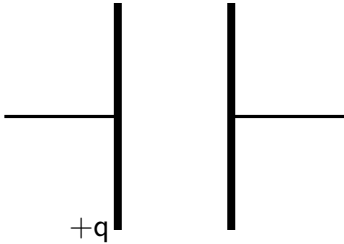
Charge d'un condensateur soumis à un échelon de tension

Présentation du condensateur

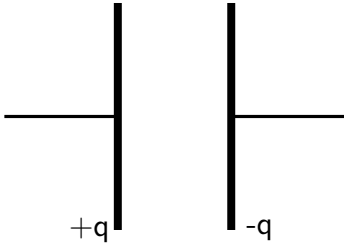
Présentation du condensateur



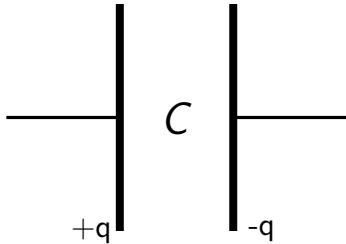
Présentation du condensateur



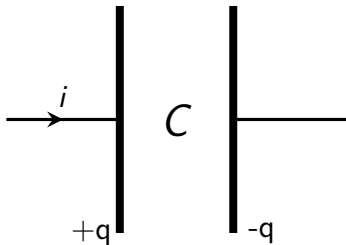
Présentation du condensateur



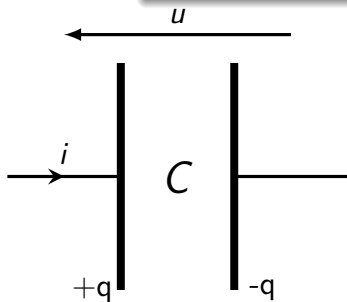
Présentation du condensateur



Présentation du condensateur

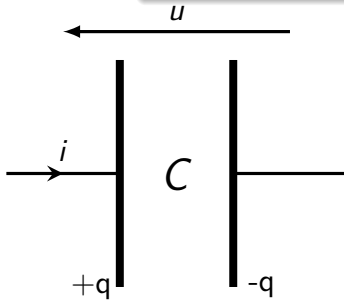


Présentation du condensateur



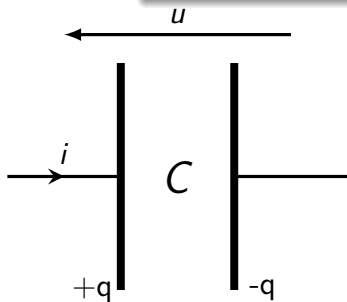
Présentation du condensateur

Relation charge-tension



Présentation du condensateur

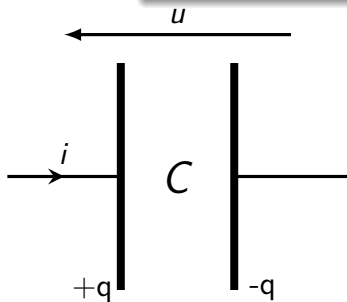
Relation charge-tension



$$q = C \times u$$

Présentation du condensateur

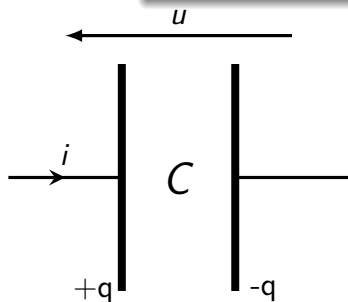
Relation charge-tension



$$q = C \times u$$

or $i = \frac{dq}{dt}$

Présentation du condensateur

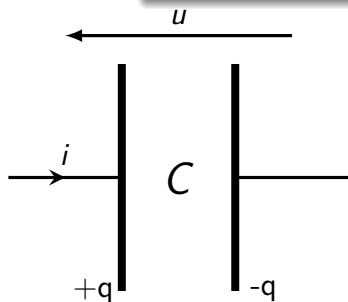


Relation charge-tension

$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

Relation intensité-tension

Présentation du condensateur



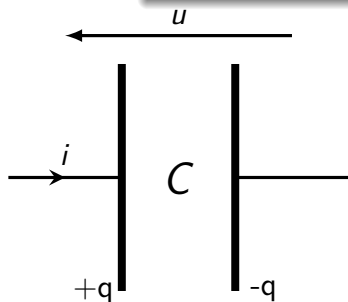
Relation charge-tension

$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

Relation intensité-tension

$$i = C \frac{du}{dt}$$

Présentation du condensateur



Relation charge-tension

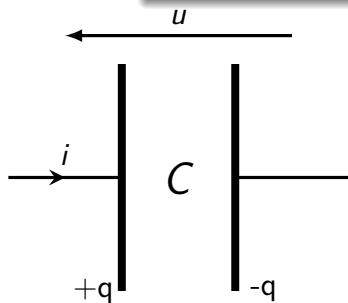
$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

Relation intensité-tension

$$i = C \frac{du}{dt}$$

Comportement en régime permanent

Présentation du condensateur



Relation charge-tension

$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

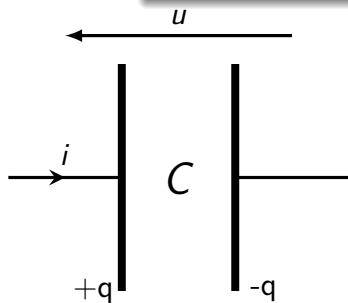
Relation intensité-tension

$$i = C \frac{du}{dt}$$

Comportement en régime permanent

$$\frac{d}{dt} = 0 \implies i = 0$$

Présentation du condensateur



Relation charge-tension

$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

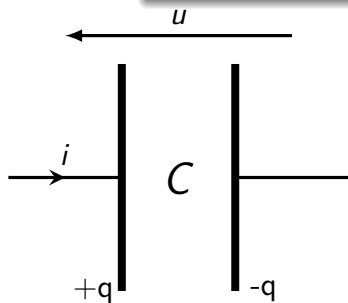
Relation intensité-tension

$$i = C \frac{du}{dt}$$

Comportement en régime permanent

$$\frac{d}{dt} = 0 \implies i = 0 \quad (\text{condensateur} = \text{interrupteur ouvert})$$

Présentation du condensateur



Relation charge-tension

$$q = C \times u \quad \text{or} \quad i = \frac{dq}{dt}$$

Relation intensité-tension

$$i = C \frac{du}{dt}$$

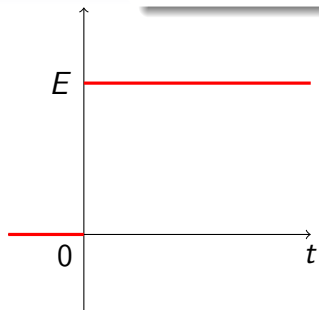
Comportement en régime permanent

$$\frac{d}{dt} = 0 \implies i = 0 \quad (\text{condensateur} = \text{interrupteur ouvert})$$

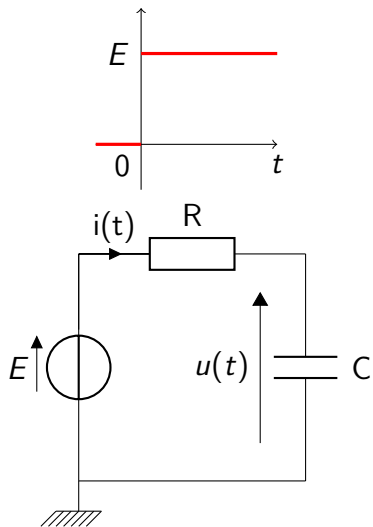
Il n'est "intéressant" qu'en régime variable.

Circuit RC et échelon de tension

Circuit RC et échelon de tension

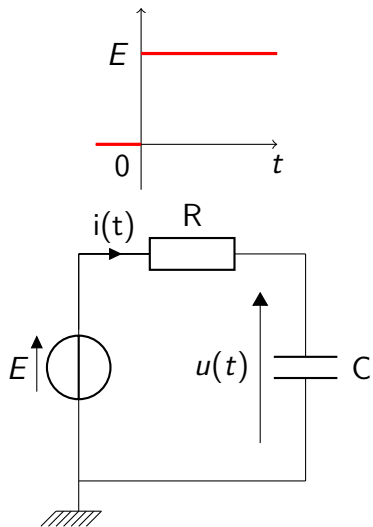


Circuit RC et échelon de tension



Circuit RC et échelon de tension

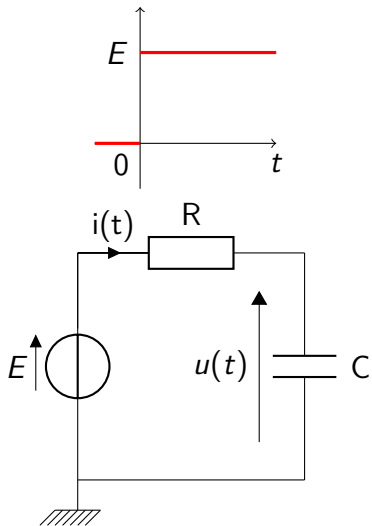
Loi des mailles



Circuit RC et échelon de tension

Loi des mailles

$$E = u(t) + R i(t)$$

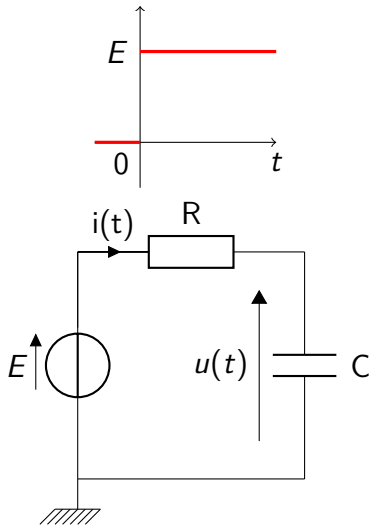


Circuit RC et échelon de tension

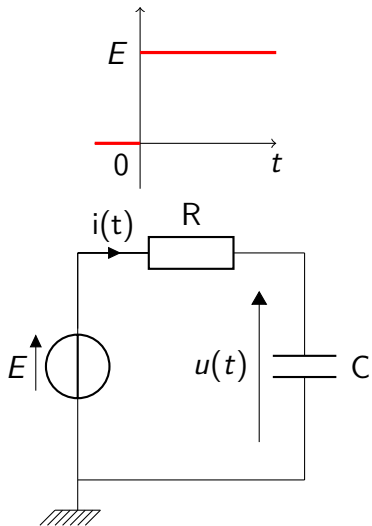
Loi des mailles

$$E = u(t) + R i(t)$$

$$\Rightarrow E = u(t) + R C \frac{du(t)}{dt}$$



Circuit RC et échelon de tension



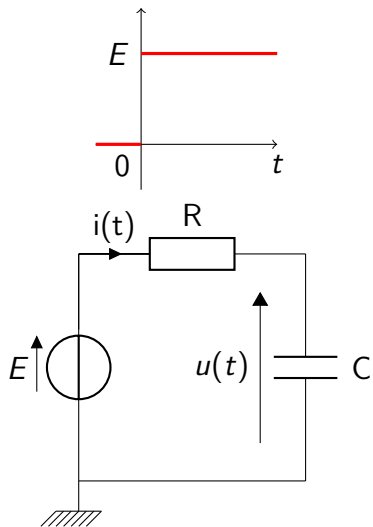
Loi des mailles

$$E = u(t) + R i(t)$$

$$\implies E = u(t) + R C \frac{du(t)}{dt}$$

Posons $\tau = RC$ et réorganisons :

Circuit RC et échelon de tension



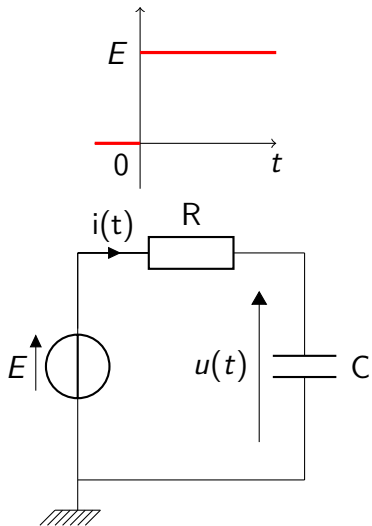
Loi des mailles

$$E = u(t) + R i(t)$$
$$\implies E = u(t) + R C \frac{du(t)}{dt}$$

Posons $\tau = RC$ et réorganisons :

$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

Circuit RC et échelon de tension



Loi des mailles

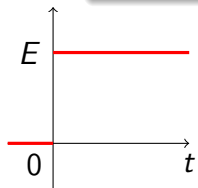
$$E = u(t) + R i(t)$$
$$\implies E = u(t) + R C \frac{du(t)}{dt}$$

Posons $\tau = RC$ et réorganisons :

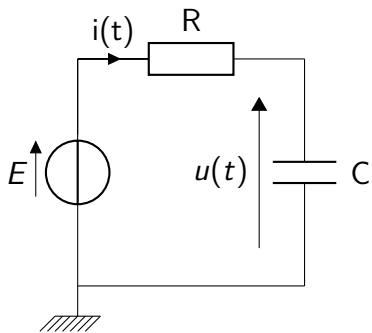
$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

Equation différentielle du premier ordre avec second membre.

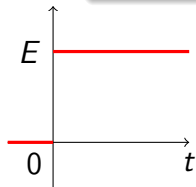
Circuit RC et échelon de tension



$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

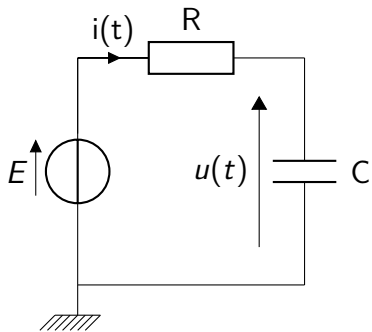


Circuit RC et échelon de tension

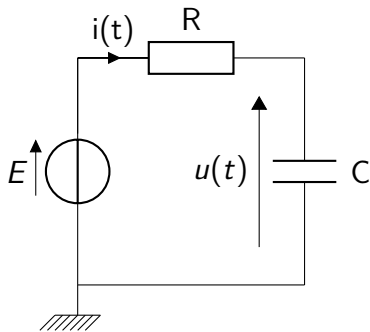
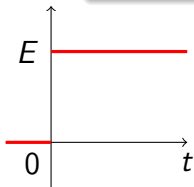


$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

Solution $u(t) = u_h + u_p \implies u(t) = A e^{-\frac{t}{\tau}} + E$



Circuit RC et échelon de tension

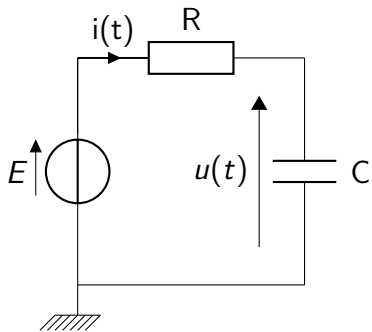
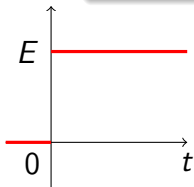


$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

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CI à $t = 0, u(t) = 0 \implies A = -E$

Circuit RC et échelon de tension



$$\dot{u} + \frac{u}{\tau} = \frac{E}{\tau}$$

Solution $u(t) = u_h + u_p \implies u(t) = A e^{-\frac{t}{\tau}} + E$

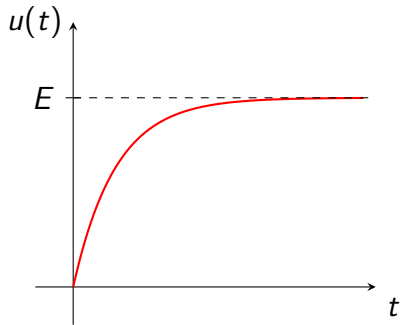
CI à $t = 0, u(t) = 0 \implies A = -E$

$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

Circuit RC et échelon de tension

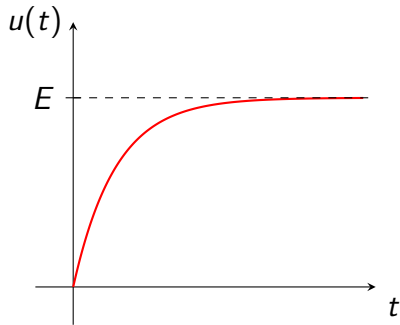
$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

Circuit RC et échelon de tension



$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

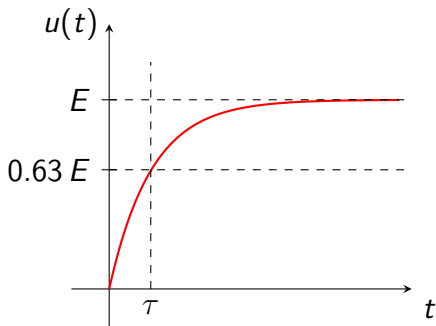
Circuit RC et échelon de tension



$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

Détermination de τ

Circuit RC et échelon de tension

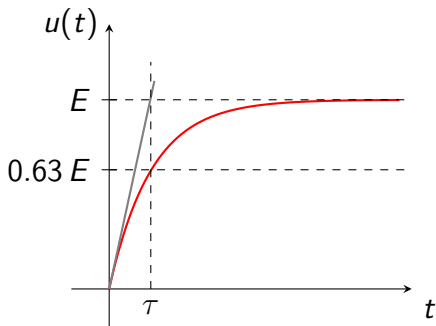


$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

Détermination de τ

- Pour $t = \tau$, $u(t) = 0,63 E$;

Circuit RC et échelon de tension



$$u(t) = E \left(1 - e^{-\frac{t}{\tau}} \right)$$

Détermination de τ

- Pour $t = \tau$, $u(t) = 0,63 E$;
- La tangente en $t = 0$ à la courbe coupe l'asymptote $u = E$ en $t = \tau$.