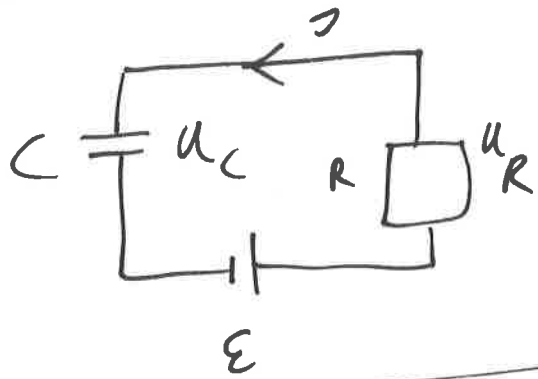


KONDENSAATTORI A

LADATTAN



$$\cancel{E = RI + U_C}$$

$$E = U_R + U_C$$

$$E = RI + \frac{Q}{C}$$

$$I = \dot{Q}$$

$$\rightarrow \dot{Q} + \frac{Q}{RC} = \frac{E}{R}$$

EDA' HOMOGEENINEN DY

(H) $\dot{Q} + \frac{Q}{RC} = 0$

$$\frac{dQ}{dt} = -\frac{Q}{RC}$$

$$\frac{dQ}{Q} = -\frac{1}{RC} dt$$

$$\ln Q = -\frac{t}{RC}$$

$$Q = e^{-\frac{t}{RC}}$$

YLEINEN RATKAISU $Q_1(t) = \text{VAKIO} \cdot e^{-\frac{t}{RC}}$

MISSÄ? $RC = \tau = \text{AIKAVAKIO}$.

(EV) $\dot{Q} + \frac{Q}{RC} = \frac{E}{R}$

JOKIN RATKAISU?

YRITE $Q = Q_{\text{FULL}}$
 $\dot{Q} = 0$

$$\rightarrow \frac{Q_{\text{FULL}}}{RC} = \frac{E}{R}$$

$$\rightarrow Q_{\text{FULL}} = CE$$

$$Q_2(t) = CE = Q_{\text{FULL}}$$

SIIS PY: N

$$\dot{Q} + \frac{Q}{RC} = \frac{\varepsilon}{RC}$$

YLEINEN RATKAISU ON

$$\begin{aligned} Q(t) &= Q_1(t) + Q_2(t) \\ &= \text{VAKIO} \cdot e^{-\frac{t}{RC}} + C\varepsilon \end{aligned}$$

KONDENSATORIN LAUKAMINEN:

$$Q(\infty) = C\varepsilon$$

$$Q(0) = \text{VAKIO} + C\varepsilon = 0 \rightarrow \text{VAKIO} = -C\varepsilon$$

$$Q(t) = C\varepsilon \left(1 - e^{-\frac{t}{RC}}\right)$$

KONDENSATORIN PVRKAMINEN:

$$\varepsilon = 0 \quad ?$$

$$Q(0) = Q_{\text{alku}} = C \overset{u}{=} \text{VAKIO} = Q_0$$

$$Q(t) = \overset{Q_0}{=} Q_0 e\left(-\frac{t}{RC}\right)$$