

ERT 19

Oppg 1) $i(t) = ?$ $u(t) = V_0 \cdot \cos(2\pi f t)$ $i(t) = C \cdot \frac{d}{dt} u(t)$

$$i(t) = C \cdot (V_0 \cdot (-\sin(2\pi f t)) \cdot 2\pi f)$$

$$= -V_0 C \cdot 2\pi f \sin(2\pi f t)$$

Oppg 2) $i(t) = I_0 \cdot \cos(2\pi f t)$ $u(t) = L \frac{d}{dt} i(t)$

$$u(t) = L I_0 \cdot 2\pi f \sin(2\pi f t)$$

Oppg 3) $u(t) = V_0 \cdot k$ $i(t) = C \frac{d}{dt} u(t)$

$$i(t) = 0$$

Oppg 4) $u(t) = 0$

Oppg 5)

a) Ja

b) Nei

c) Ja

d) Nei

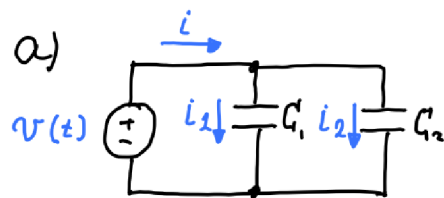
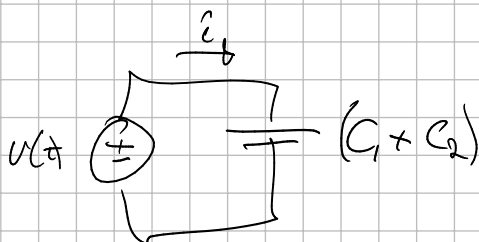
Oppg 6

a) $i = i_1 + i_2$

$$i = C_1 \frac{d}{dt} u(t) + C_2 \frac{d}{dt} u(t)$$

$$i(t) = (C_1 + C_2) \frac{d}{dt} u(t)$$

$$i = C \frac{d}{dt} u$$



c)

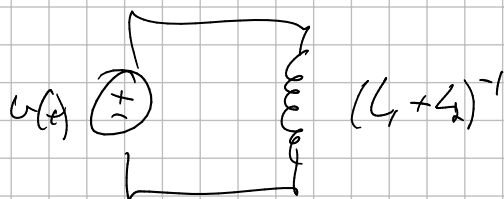
$$i = i_1 + i_2$$

$$v(t) = L \frac{d}{dt} i(t)$$

$$\int v(t) dt = L i(t)$$

$$i(t) = \frac{1}{L} \int v(t) dt$$

$$i = \frac{1}{L_1} \int v(t) dt + \frac{1}{L_2} \int v(t) dt$$



$$i = (L_1 + L_2)^{-1} \int v(t) dt$$

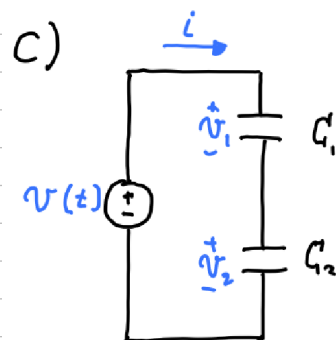
d) $v(t) = v_1(t) + v_2(t)$

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

$$v(t) = \left(\frac{1}{C_1} + \frac{1}{C_2} \right) \int i(t) dt$$

$$\int i(t) dt = C v(t)$$

$$v(t) = \frac{1}{C} \int i(t) dt$$

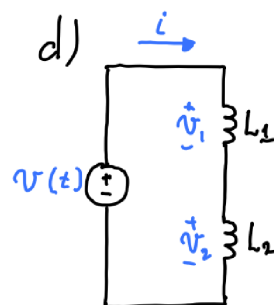


d)

$$v(t) = v_1 + v_2$$

$$v(t) = L \frac{d}{dt} i(t)$$

$$v(t) = (L_1 + L_2) \frac{d}{dt} i(t)$$



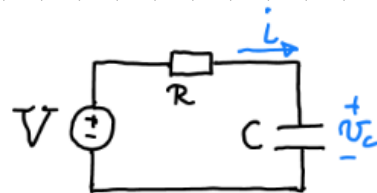
Oppg 8) $RC \frac{d}{dt} U_c + U_c = V$

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

$V = iR + U_c$

i over motstand og C er lik

$= RC \frac{d}{dt} U_c + U_c$



Oppg 9) $U_c(0) = 0$ $U_c(t)$ & $i(t)$ $t > 0$

$RC \frac{d}{dt} U_c + U_c = V$

$\dot{U}_c + \frac{1}{RC} U_c = \frac{V}{RC}$ $\lambda = \frac{1}{RC}$

$\dot{U}_c + \lambda U_c = \lambda V$ $\int e^{\lambda t}$

$\frac{d}{dt} U_c e^{\lambda t} + \lambda U_c e^{\lambda t} = \lambda V e^{\lambda t}$

$\frac{d}{dt} (U_c e^{\lambda t}) = \lambda V e^{\lambda t}$ $\int \int dt$

$U_c e^{\lambda t} = V e^{\lambda t} + C$ $\int e^{-\lambda t}$

$U_c = V + C e^{-\lambda t}$

$U_c = V + C e^{-\frac{1}{RC} t}$

$U_c(0) = 0$

$V + C = 0$

$C = -V$

$U_c(t) = V(1 - e^{-\frac{1}{RC} t}) = V - V e^{-\frac{1}{RC} t}$

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

$i(t) = C \cdot (0 - (-\frac{1}{RC}) V e^{-\frac{1}{RC} t})$

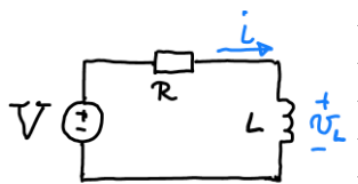
$i(t) = \frac{1}{R} V e^{-\frac{1}{RC} t}$

Oppg 2) $\underline{u_L(\infty) = V}$ $\underline{i(\infty) = 0}$

Oppg 3) $V = iR + u_L$ $u(t) = L \frac{d}{dt} i(t)$

$$V = iR + L \frac{d}{dt} i(t)$$

$$\frac{d}{dt} i(t) + \frac{R}{L} i = \frac{1}{L} V$$



Oppg 4)

$$\frac{d}{dt} i(t) + \frac{R}{L} i = \frac{1}{L} V \quad | \cdot e^{\frac{R}{L} \tau}$$

$$\frac{d}{dt} i(t) e^{\frac{R}{L} \tau} + \frac{R}{L} i e^{\frac{R}{L} \tau} = \frac{1}{L} V e^{\frac{R}{L} \tau}$$

$$\frac{d}{dt} (i(t) e^{\frac{R}{L} \tau}) = \frac{1}{L} V e^{\frac{R}{L} \tau} \quad | \int dt$$

$$i(t) e^{\frac{R}{L} \tau} = \frac{1}{R} V e^{\frac{R}{L} \tau} + D \quad | \cdot e^{-\frac{R}{L} \tau}$$

$$i(t) = \frac{1}{R} V + D e^{-\frac{R}{L} \tau}$$

$$i(0) = I_0$$

$$\frac{1}{R} V + D = I_0$$

$$D = I_0 - \frac{1}{R} V$$

$$i(\tau) = \frac{1}{R} V - (I_0 - \frac{1}{R} V) e^{-\frac{R}{L} \tau}$$

$$u_L = L \frac{d}{dt} i(t)$$

$$u_L(t) = L \cdot \frac{R}{L} (I_0 - \frac{1}{R} V) e^{-\frac{R}{L} \tau}$$

$$= R (I_0 - \frac{1}{R} V) e^{-\frac{R}{L} \tau}$$

$$= I_0 R - V e^{-\frac{R}{L} \tau}$$

Opg 16)

$$i(\infty) = \frac{U}{R} \quad u_L(\infty) = \int_0 R$$

