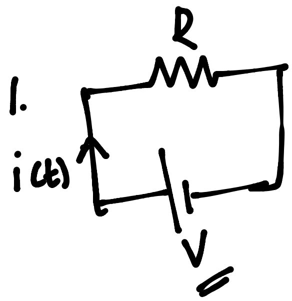
Agenda :- Understand R, RL, RC Ckts

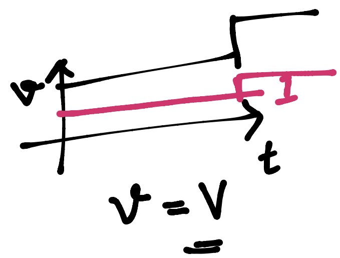
1.



$i \propto V$

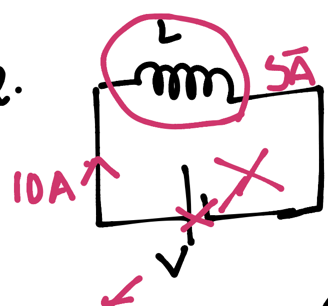
$i \propto V$

$I = i = \frac{V}{R}$



$v = V$

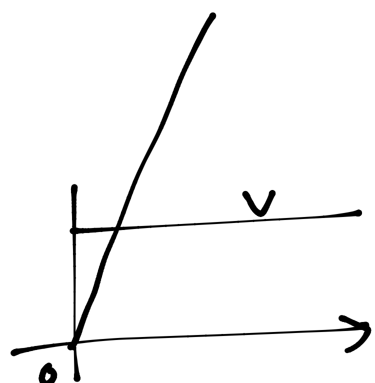
2.



$i \propto V$

$i = V \propto$

$= \frac{Vt}{L}$



$y = \frac{Vt}{L}$

$= mx$

2A

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

$$i = \frac{1}{L}\int_0^1 v(t)\,dt = \frac{1}{L}\int_0^1 V\,dt = \frac{1}{L}\left[Vt\right]_0^1$$

$$= \frac{V}{L} \times 1 = \frac{V}{L}$$

$= \left(\frac{V}{L}\right)$ or $V = iL$

$i = \frac{V}{L}$

$V = 5V$

$L = 10^{-3}$

$= 5 \times 10^{3}$

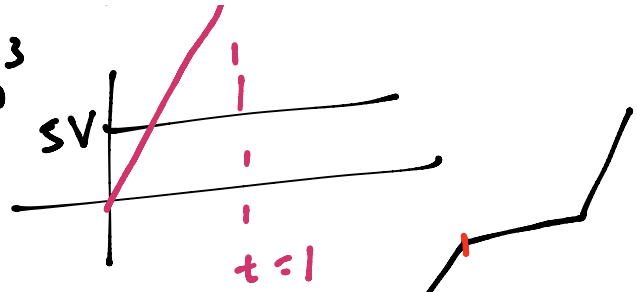
$V \times L$

$V = 5V$

$L = 1e^{-3}$

$\frac{V}{L} = 5\times10^{3} V/H$

$5\times10^{-3} = 5\times10^{3}$



$i = \frac{V}{L}t = 5\times10^{3}t$

at $t=1$

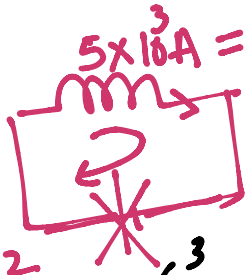
$= 5\times10^{3} A$

1 1

$i = \frac{1}{L}\int_{0}^{x=2} v(a)\,dt + c$

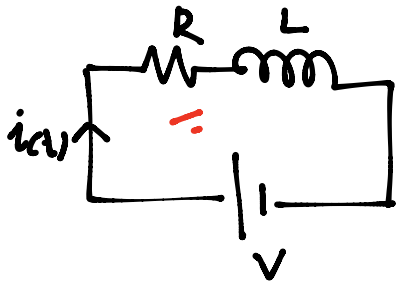
$= A$

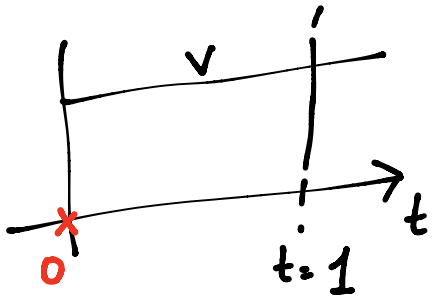
$= 0$



$= \frac{1}{L}\int_{0}^{2} = \int_{0}^{1} + \int_{1}^{2} + \int_{2}^{3}$

$= 5\times10^{3} + 0 = 5\times10^{+3}$





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

1. $\frac{di}{dt} = 0,\ i = I_{st}$

$V = RI \Rightarrow \boxed{I = V/R}$ — ①

2. $V = 0$

$$Ri(t) + L\frac{di}{dt} = 0$$

$$Ri(t) = -L\frac{di}{dt}$$ A

$$\int -\frac{R}{L}dt = \int \frac{di}{i}$$

$$-\frac{R}{L}t = \ln i + \ln c$$

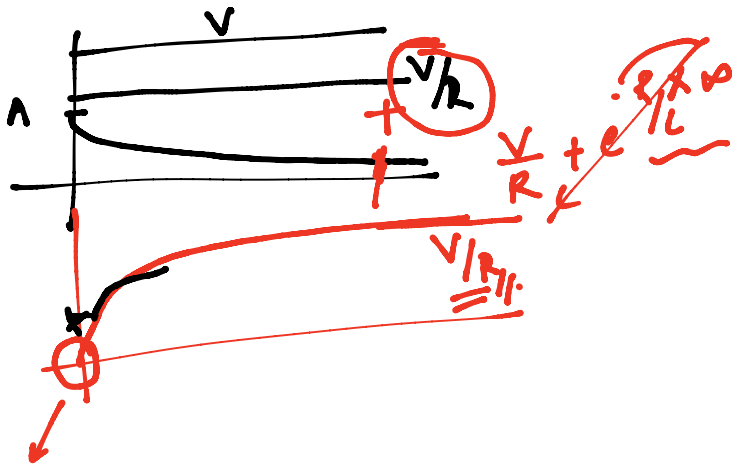
$$= \ln(ic)$$

$$\Rightarrow i = \frac{1}{c}e^{-R/L t}$$

$$= \underline{i = Ae^{-R/L t}}$$

$i = Ae^{-R/L t} + \frac{V}{R}$

$R = \quad R > 1\ \Omega$



$i = Ae^{-R/L t} + \frac{V}{R}$

at $t = 0$, $i(0) = A + \frac{V}{R}$

$= 0$ $\quad A = -V/R$

$$\Rightarrow i = \frac{V}{R}\left(1 - e^{-R/L\,t}\right) \checkmark$$

$$i(0) = K = I_0$$

$$\text{i.e. } \frac{V}{R} + A = I_0 \Rightarrow A \cdot \left(I_0 - V/R\right)$$

$$i = \left(I_0 - \frac{V}{R}\right) e^{-R/L\,t} + V/R$$

$$= I_0 e^{-\frac{R}{L}t} + \frac{V}{R}\left(1 - e^{-\frac{R}{L}t}\right)$$

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

1. $\frac{di}{dt} = 0$ (Steady state) $\Rightarrow V = 0$

2. $L\frac{di}{dt} + Ri(t) = V$ → Mathematics

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

$i = y$, $t = x$

$$\frac{dy}{dx} + Py = Q$$

$$y = e^{-\int P\,dx}\left[\int e^{\int P\,dx} Q + C\right]$$

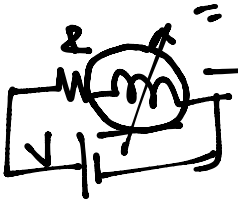
$$i(t) = e^{-\int R/L\,dt}\left[\int e^{+\int R/L\,t} \cdot V/L + C\right]$$

$$= e^{-R/L\,t}\left[\int \frac{V}{L} \cdot e^{R/L\,t} + C\right]$$

$$= e^{-R/L\,t}\left[\frac{V}{\cancel{L}}\, e^{R/L\,t} \times \frac{\cancel{L}}{R} + C\right]$$

$$= \left[\frac{V}{R}\, e^{+R/L\,t}\right] \cdot e^{-R/L\,t} + C e^{-R/L\,t}$$

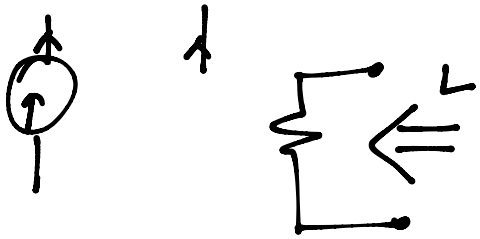
$$= \frac{V}{R} + C e^{-R/L\,t} = C e^{-R/L\,t} + \frac{V}{R} \checkmark$$



3. $i = i_{tr} + i_{s.s}$

$$i = \pm e^{-t/\tau} + \frac{V}{R}$$

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



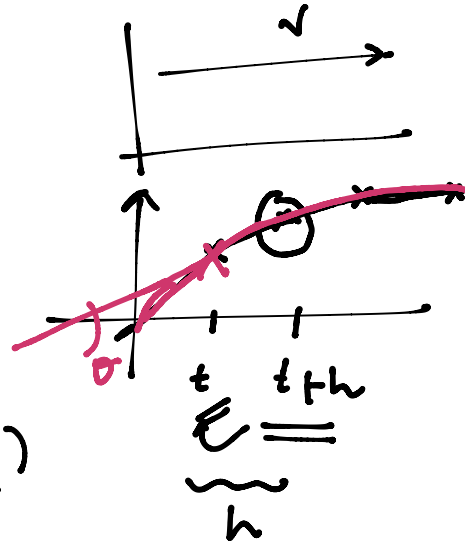
$$i = Ae^{-R/L\,t} + \frac{V}{R}$$ ✓

$$x'(t) = \frac{x(t_{n+1}) - x_n}{h}$$

4. $V = Ri(t) + L\frac{di}{dt}$

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

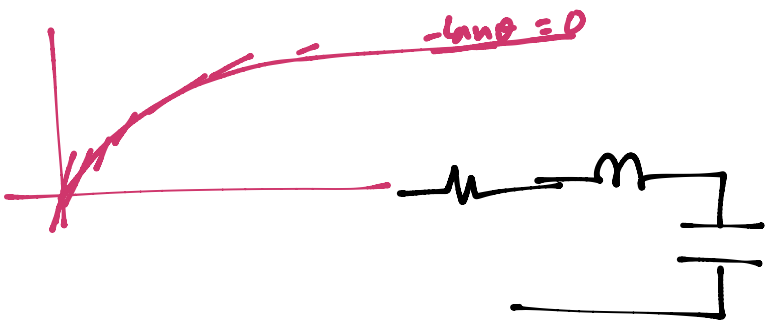
$$\frac{i(t+h) - i(t)}{h} = \frac{V - Ri(t)}{L}$$



$$i(t+h) = h\left\{\frac{V - Ri(t)}{L}\right\} + i(t)$$

$$i(t+h) = h\frac{di}{dt} + i(t) \qquad * \; i = V/R$$

$$i(t+h) = h\frac{di}{dt} + i(t) = h\tan\theta + i(t)$$

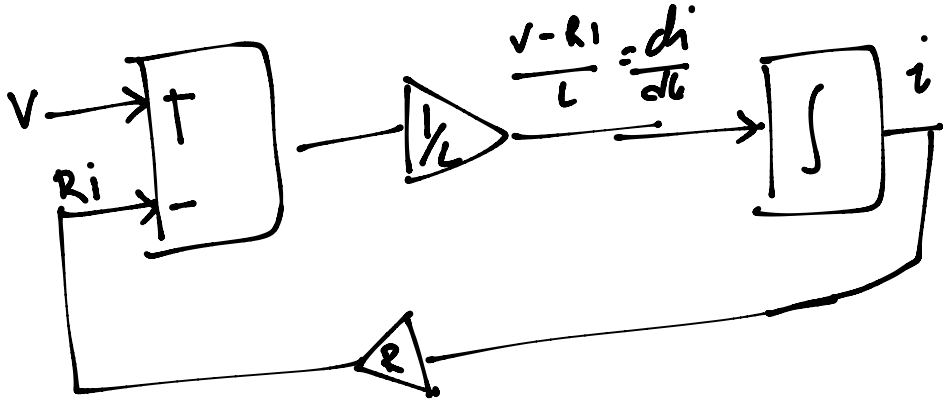


5. $L \cdot \frac{1}{T} \longrightarrow$ S dom $\longrightarrow$ t domain

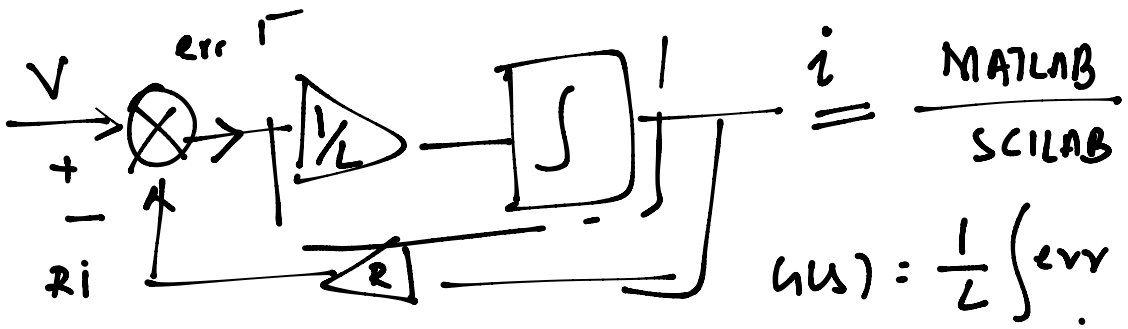
6. $L\frac{di}{dt} + Ri = V$

$$\frac{di}{dt} = \frac{V - Ri}{L}$$

$$i = \int di = \int \frac{V - Ri}{L}\, dt$$



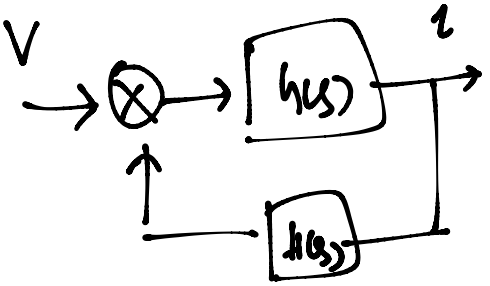
G(s)



i = MATLAB / SCILAB

$G(s) = \frac{1}{L}\int err$

H(s)



$err = 0$

$V - Ri - 0$

$i_{st} = V/R$

$H(s) = R$

$= \frac{1}{L}\int (v - iR)$

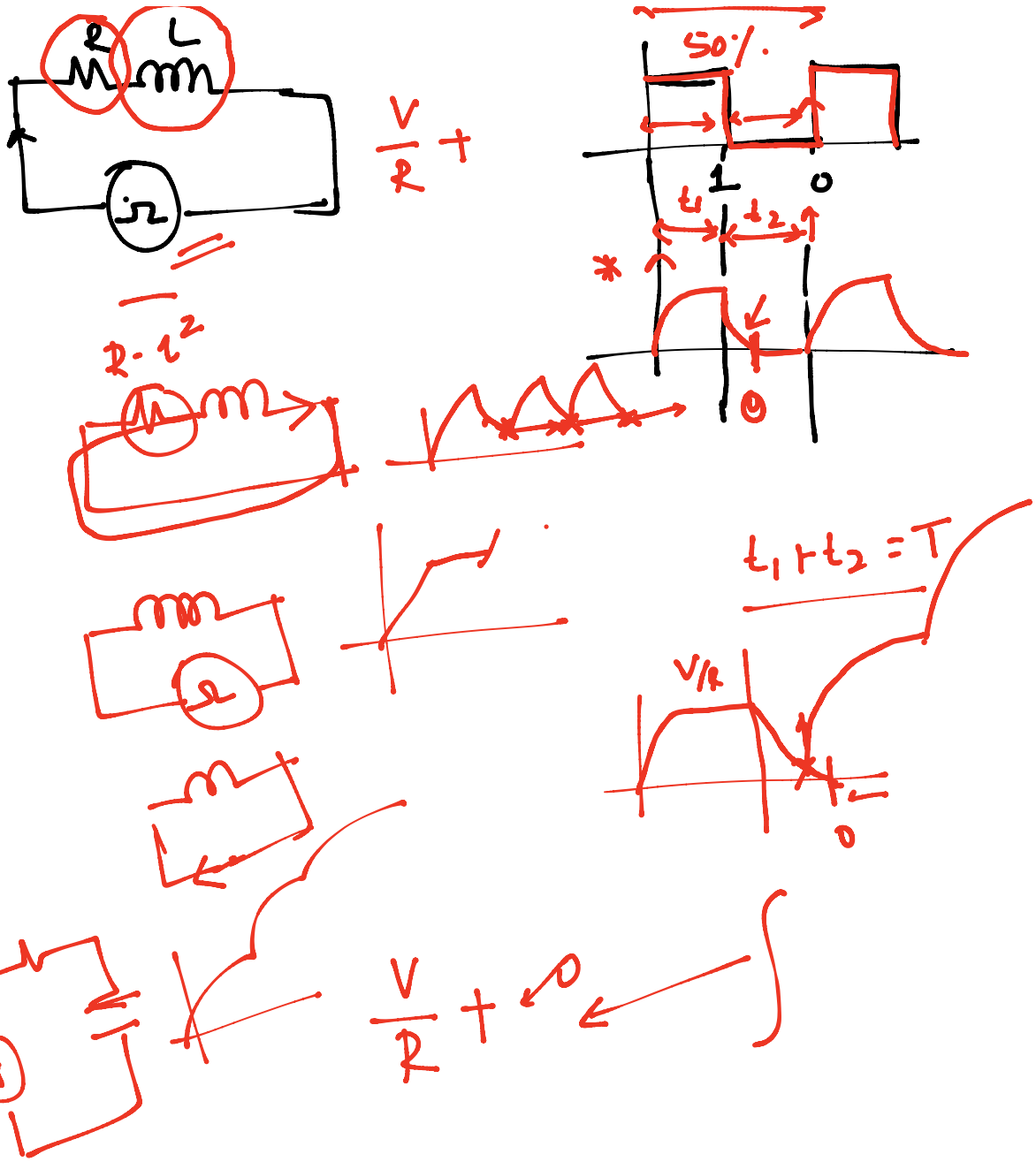
H.W

D. C CKt →

1 R-CCKt →

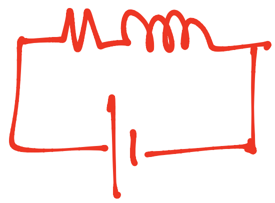
`MATLAB'

$\int + \leq$



→ R-C CKt

→ Use MATLAB → (2)(3) — MATLAB



→ ① D.E ✓ → M file
→ ② control s/m
↳ simulink
→ ③ Numerical methods
*

→ R–C →
→ Brush Bap – matlab →

✓ F.P.E
Robert Erickson