

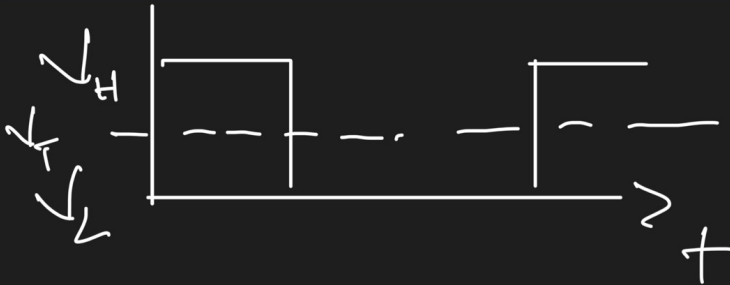
## E. Analogică



## Electronica Numerică



Impuls IDEAL



threshold  
(prog)

Voltage High  $\in (-u; +u)$   
Low  $\in (-u; +u)$

$$V_H > V_L$$

Practica:  $V_H = +U$  ex. (3, 5V)

$V_L = 0V$

$$\begin{cases} < \text{prog} \rightarrow V_L \text{ inf.} \\ > \text{prog} \rightarrow V_H \text{ sup.} \end{cases}$$

$$\begin{cases} V_H \rightarrow 1 \text{ logic} \\ V_L \rightarrow 0 \text{ logic} \end{cases}$$

Circuitele numerice

Dublă natură

Electronica (transistori, diode, rez.)

Logică

SA

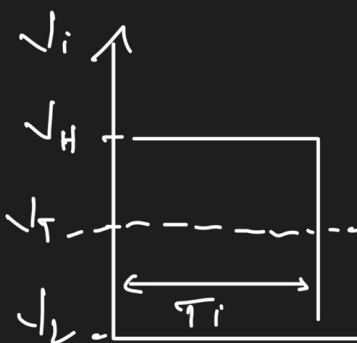
NU

Si - Si-NU

SAU - SAU-NU

Impuls Ideal (semnal numeric ideal)

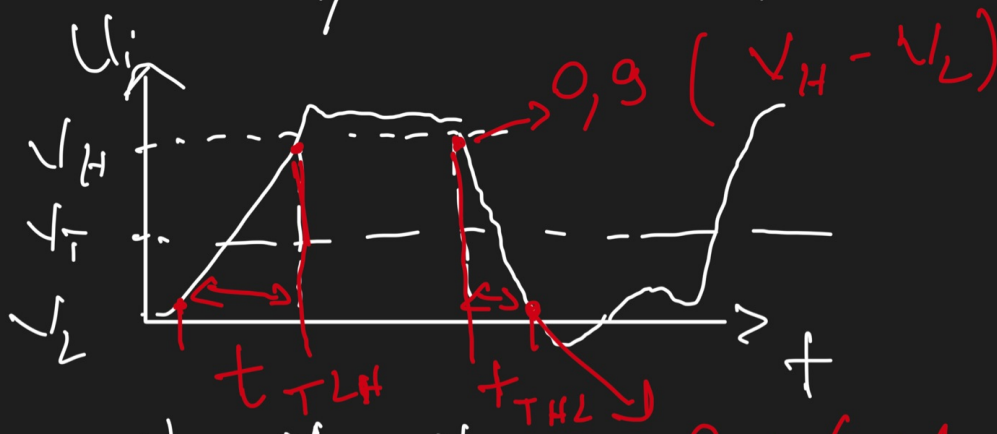
Parametri



- 1)  $V_H, V_L$  [V]
- 2)  $V_T$  ideal  $\frac{V_H + V_L}{2} = V_T$  [V]
- 3)  $T_i$  (durata impuls) [s]
- 4)  $T$  (durata de repetitie) [s]  $F = \frac{1}{T}$  [Hz]

Circuit numeric ideal  $U_e \in [V_H, V_L]$

## Impuls Real



1)  $V_H, V_L$

2)  $V_T$

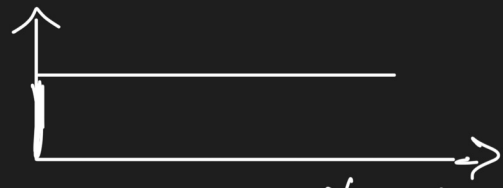
3)  $T_i$   $\left( \frac{V_H + V_L}{2} \right)$

4)  $T$

5)  $t_{TLH}; t_{THL}$

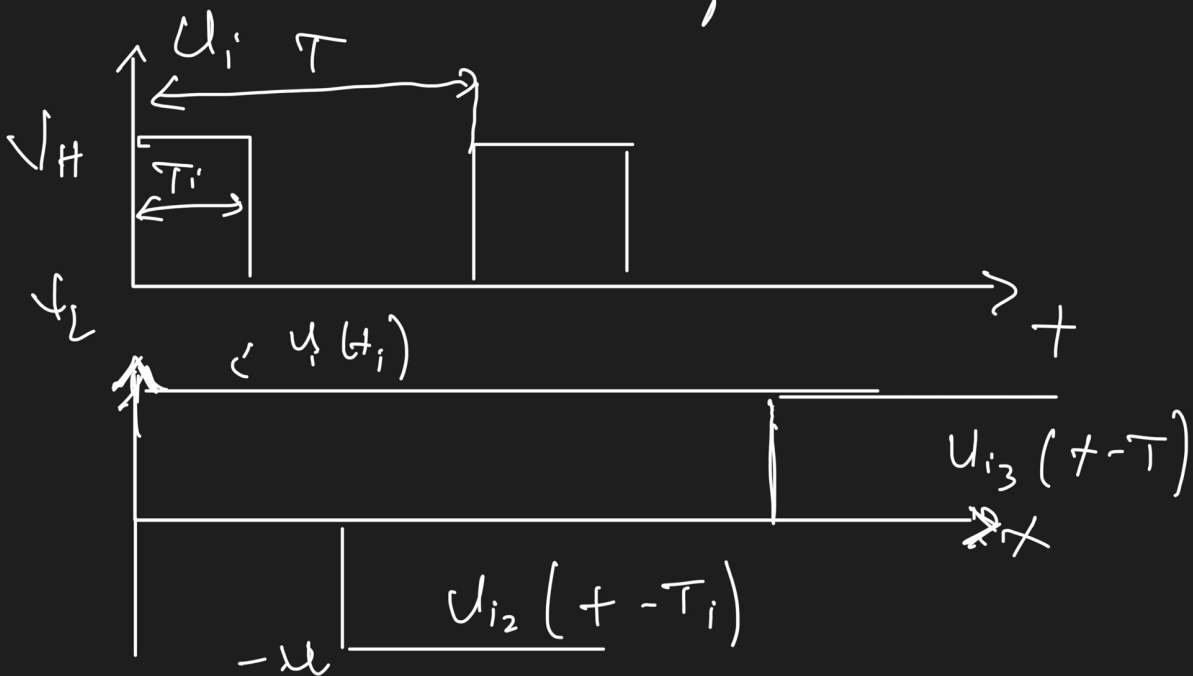
# Semnale de bază

A) sem. treaptă

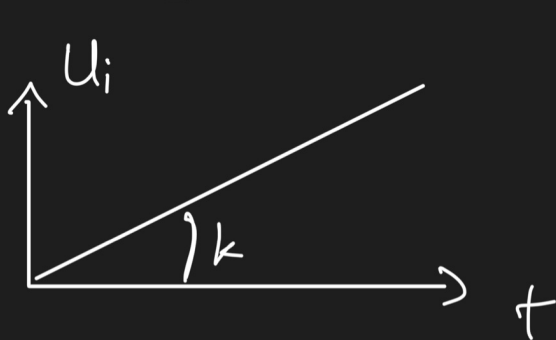


$$u_i \in \begin{cases} 0, & t < 0 \\ u_1, & t \geq 0 \end{cases}$$

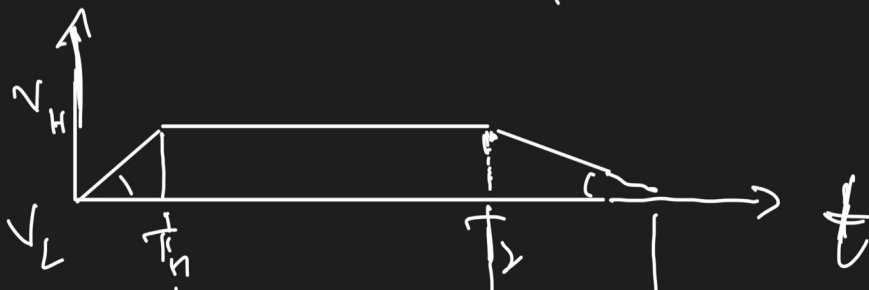
ex. impulsul este format din  
sume de sem. treaptă

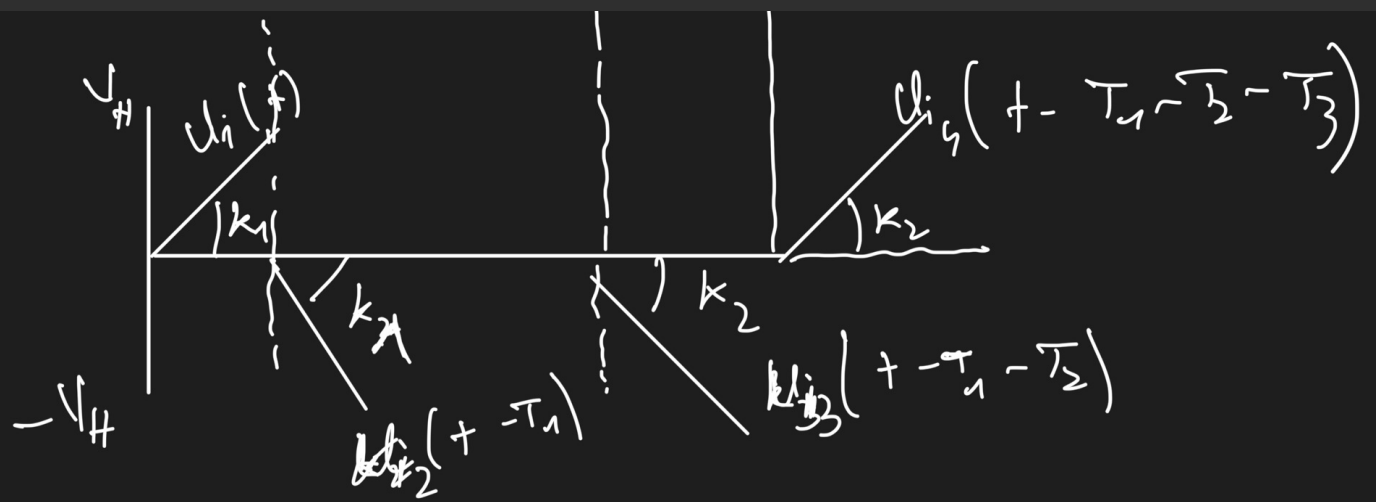


Sem. liniare variabile

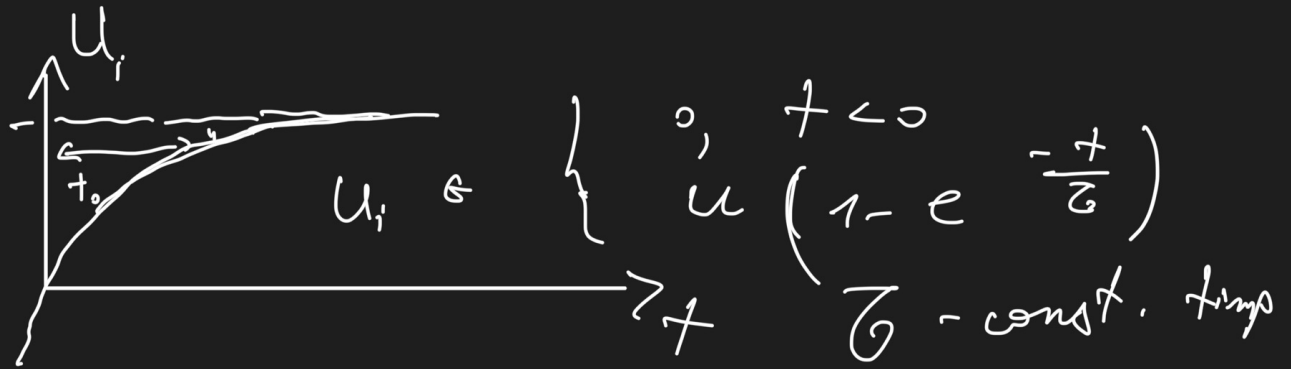


$$u_i = \begin{cases} 0, & t < 0 \\ kt, & t \geq 0 \end{cases}$$





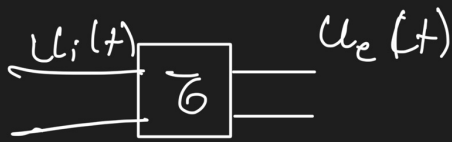
Sem. exp.



Analiza chc. numerice

a) metode integra-diferentiale  
→ o singura

b) met. suprapunerii sem



$$\bullet \quad \frac{d U_e(t)}{dt} \tau + U_e(t) = U_i(t)$$

$$U_e(t) = U_{e1}(t) + U_{e2}(t)$$

$$U_{e1}(t) = \text{resp. ec. dif.}$$

$$\bullet \quad \frac{d U_{e1}(t)}{dt} \tau = 0$$

$$U_{e1}(t) = A e^{-\frac{t}{\tau}}$$

$$U_e(t) = U_{e2}(t) + A e^{-\frac{t}{\tau}}$$

$$a) \quad t \rightarrow \infty$$

$$U_e(\infty) = U_{e2}(\infty)$$

$$U_e(t) = U_e(\infty) + A \cdot e^{-\frac{t}{\tau}}$$

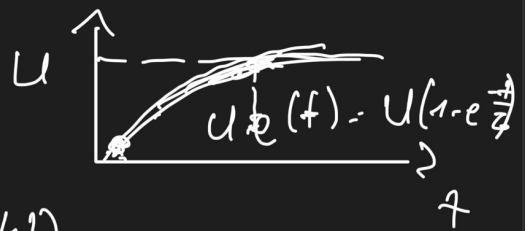
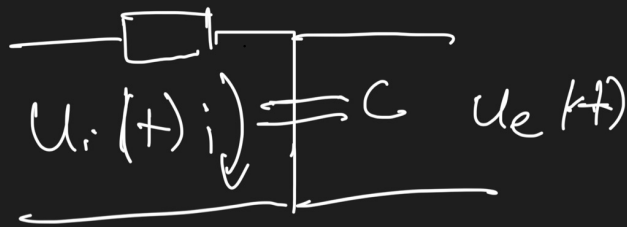
$$b) \quad t = 0$$

$$U_e(0) = U_e(\infty) + A$$

$$A = U_e(0) - U_e(\infty)$$

$$U_e(t) = U_e(\infty) + [U_e(0) - U_e(\infty)] \cdot e^{-\frac{t}{\tau}}$$

Free circuit



$$X_C = \frac{1}{\omega C}$$

$$\omega = 2\pi F$$

$$\left\{ \begin{array}{l} \text{at } t=0, F=\infty \\ \rightarrow X_C = 0 \\ \rightarrow U_{e0} = 0 \\ \text{at } t=\infty, F=0 \\ X_C = \infty, i=0 \\ U_e(\infty) = U \end{array} \right.$$

$$t_2 = \frac{1}{2} t_1$$

$$U_e(t_2) = 0,9 U = U_e(\infty) + \left[ U_e(0) - U_e(\infty) \right] e^{-\frac{t_2}{\tau}}$$

$$t_2 = \tau \ln \frac{U_e(\infty) - U_e(0)}{U_e(\infty) - U_e(t_2)}$$

$$t_1 = -\tau$$

$$t_2 = \tau \ln \frac{U_e(\infty) - U_e(t_1)}{U_e(\infty) - U_e(t_2)}$$

$$= RC \ln \frac{U - 0,1U}{U - 0,9U}$$

$$= RC \ln 9 \approx 2,3 RC$$