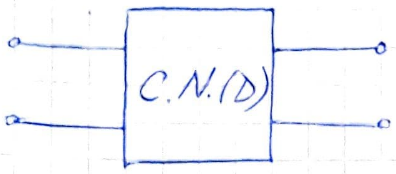
CURS 1 - CD

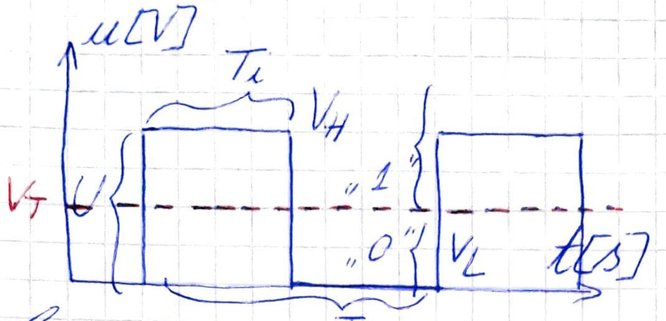
a)



⇒ f. logică
⇒ f. electronică

⇒ DA (repetor)
ȘI NU (inversor)
SAU ȘI-NU
SAU-NU

b)



Semnalul de bază (ideal) se numește impuls

V_T - tensiune de prag

Circuitul e comandat de un semnal de bază.

T_i - durată Impulsul are 3 parametri

1) U - amplitudinea $U = V_H - V_L$ [V]

2) T_i - durata impulsului [ms, μs, ns, ps]

3) T - durata de repetiție

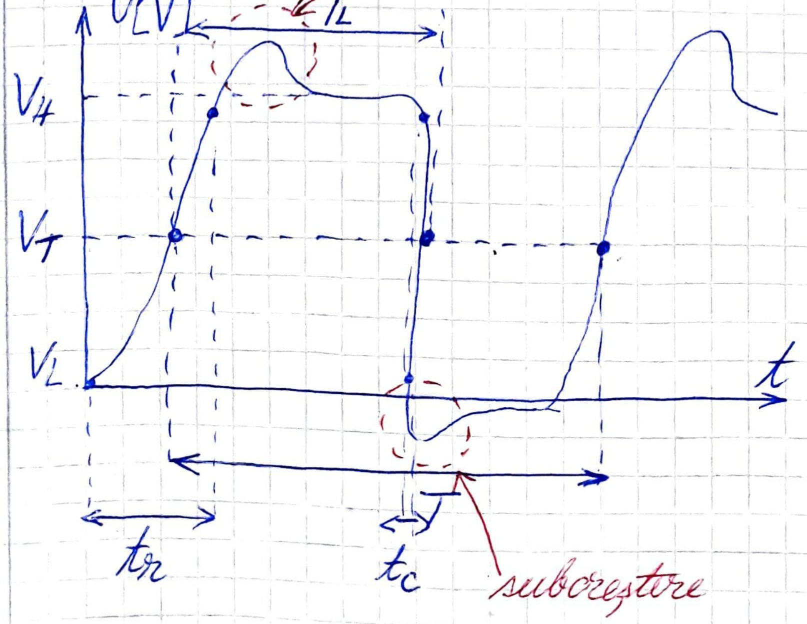
$F = \frac{1}{T}$ - frecvența de repetiție [Hz, kHz, MHz, GHz]

$V_H \rightarrow$ „1"
$V_L \rightarrow$ „0"

semnale binare V_T - tensiunea de prag

Circuitului numeric i se atribuie o valoare binară. Sistemele numerice lucrează cu sisteme binare, 0 și 1.

Impuls real



Front

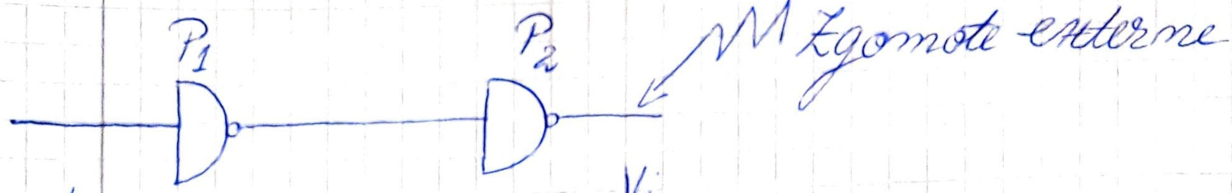
t_r - front ridicător

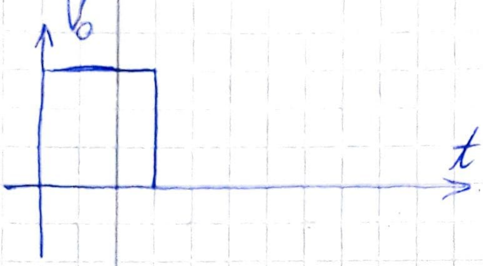
t_c - front coborâtor

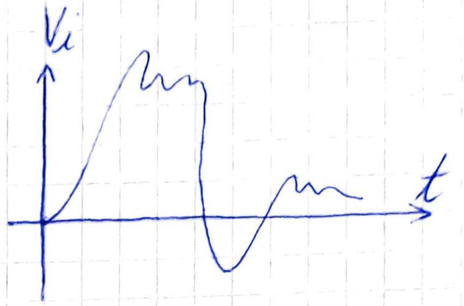
Timp de tranziție

$t_r = t_{TLH}$

$t_c = t_{THL}$







<u>Componente electronice:</u>

- rezistență
- diode
- tranzistori — bipolari / unipolare
- capacități

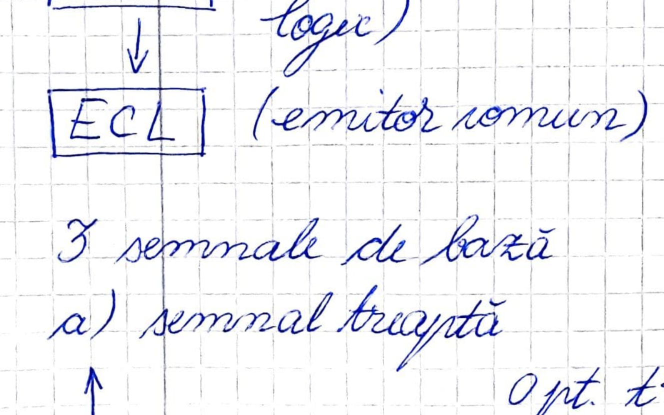
<u>Circuitele integrate numerice</u> se clasifică prin familie

- bipolare
  - TTL (tranzistor logic)
  - ECL (emitor comun)
- unipolare
  - MOS (*metal, oxid, semiconductor)
  - CMOS (circuite cu * complementare)

3 semnale de bază

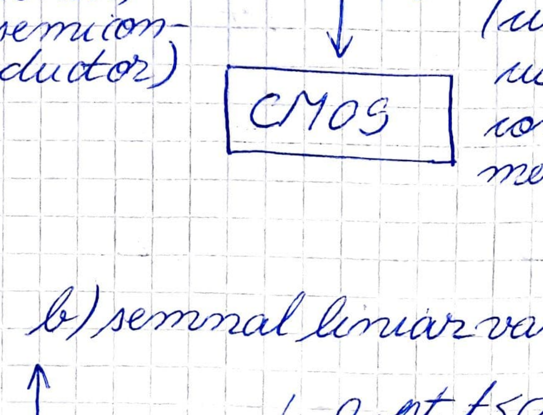
a) semnal treaptă

0 pt. $t<0$
U pt. $t \geq 0$

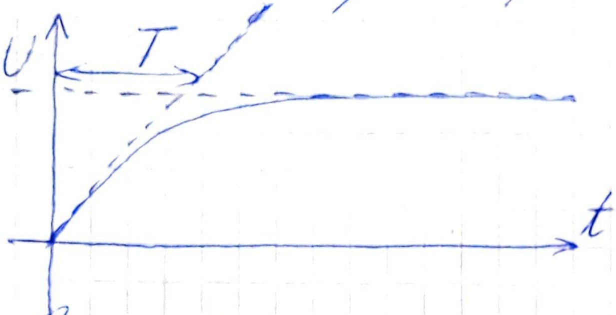


b) semnal liniar variabil

0 pt. $t<0$
kt pt $t \geq 0$

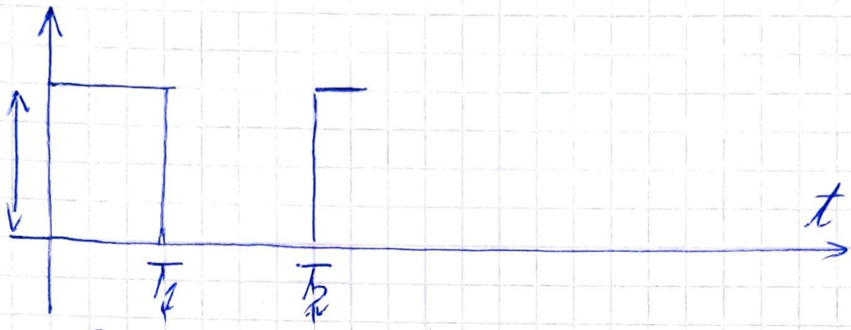


c) semnal exponențial

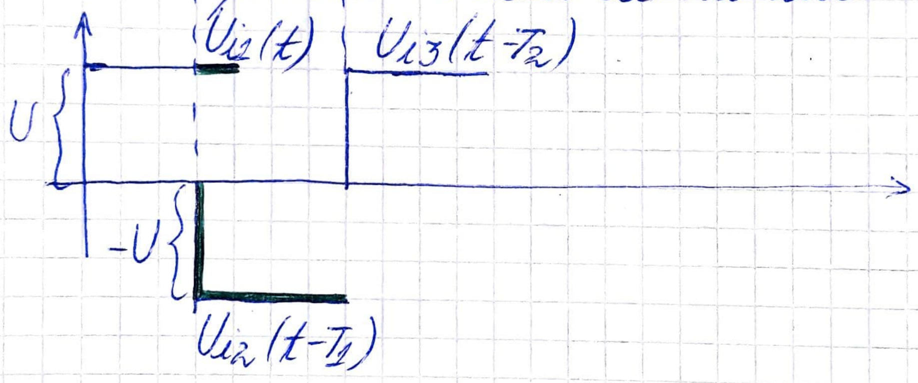


$$\begin{cases} 0 & \text{pt. } t<0 \\ U\left(1-e^{-\frac{t}{T}}\right) & \text{pt. } t\geq 0 \end{cases}$$

Cu ajutorul unui semnal putem reconstrui orice semnal de bază.



Descompun semnalul elementar

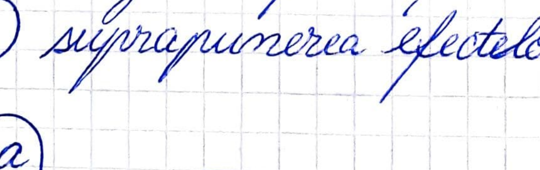


Analiza circuitelor numerice în cazul aplicării unui semnal la intrare

1) ec. integro-diferențială

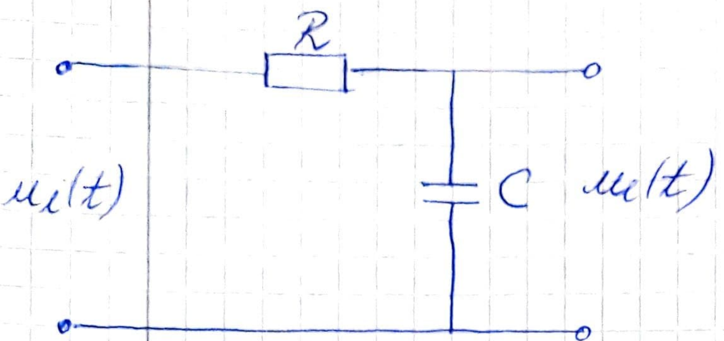
2) suprapunerea efectelor

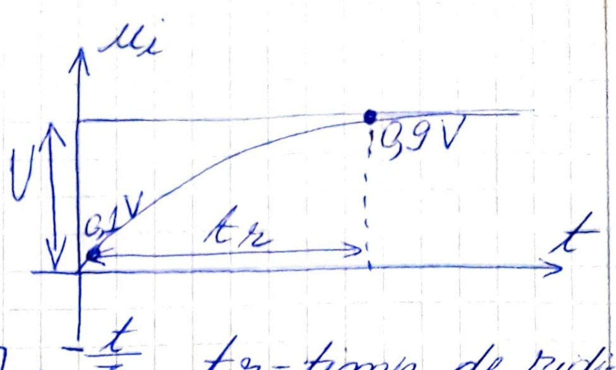
1a)



ec. dif.: $\boxed{\tau \frac{du_e(t)}{dt} + u_e(t) = u_i(t)}$, dacă $u_i(t) = U$ ⌐

$$\boxed{u_e(t) = u_e(\infty) + \left[u_e(0) - u_e(\infty)\right] e^{-\frac{t}{\tau}}}$$





$$u_e(t)=u_e(\infty)+[u_e(0)-u_e(\infty)]\cdot e^{-\frac{t}{\tau}}$$ t_r - timp de ridicare

τ = constantă de timp = RC

$X_c=\frac{1}{\omega\cdot C}$ $\quad \omega=2\pi F$

a) pt. $t=0$ $\quad F\to\infty \Rightarrow \omega\to\infty \Rightarrow X_c=0$

$u_e(0)=0$

b) pt. $t=\infty$ $\quad F=0 \Rightarrow \omega=0 \Rightarrow X_c\to\infty$

$u_e(\infty)=u_i(\infty)=U$

$$u_e(t)=U+[0-U]\cdot e^{-\frac{t}{RC}}=U(1-e^{-\frac{t}{R\cdot C}})$$

$$t_r=R\cdot C\cdot \ln\frac{u_e(fin)-u_e(init)}{u_e(fin)-u_e(*)}$$

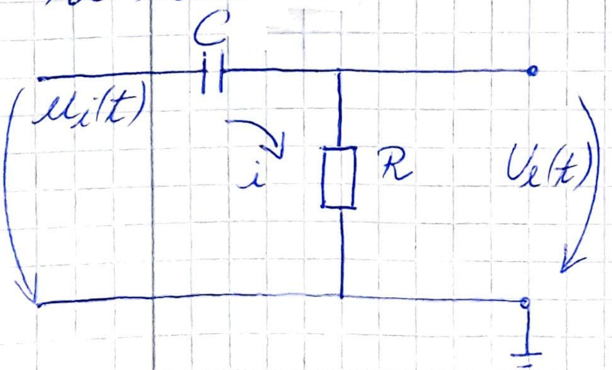
$u_e(final)=U$

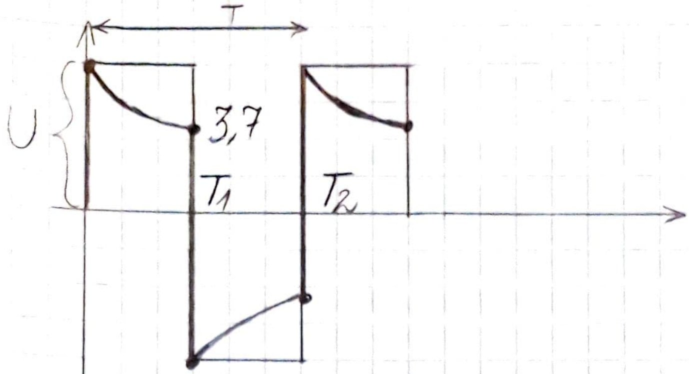
$u_e(init)=0,1V$

u_e(unde vreau să ajung*) $=0,9U$

$$t_r=RC\cdot\ln\frac{U-0,1U}{U-0,9U}=RC\ln 9\approx 2,2R\cdot C$$

RC trece sus





$T_1 = 10\mu s$

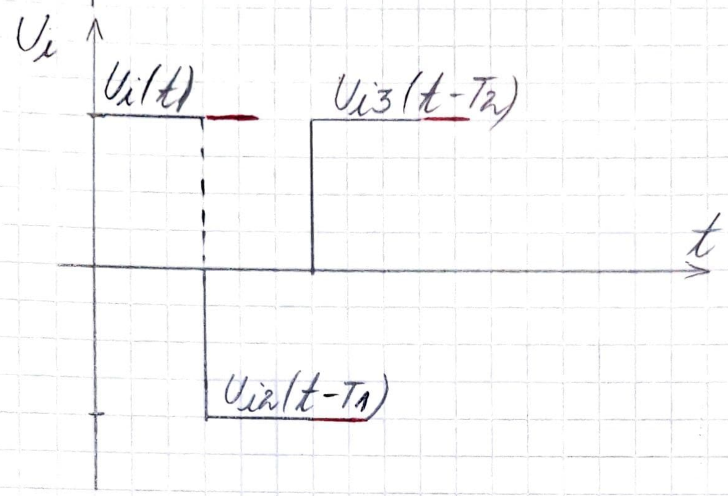
$T_2 - T_1 = 10\mu s$

$R = 1k\Omega$

$C = 10nF$

$\tau = 10\mu s$

$U = 10V$



a) pt $0 \le t < T_1$

$U_e(t) = U \cdot e^{-\frac{t}{\tau}}$

b) pt. $t = T_1 \Rightarrow U_e(T_1) = U \cdot e^{-\frac{T_1}{RC}}$

$U_e(T_1) = U \cdot e^{-1} = 3{,}7V$

c) pt. $T_1 < t < T_2$

$U_e(t) = U \cdot e^{-\frac{t}{RC}} - U \cdot e^{-\frac{(t-T_1)}{RC}}$

d) pt. $T = T_2$

$U_e(t) = U \cdot e^{\frac{T_2}{RC}} - U \cdot e^{-\frac{(T_2-T_1)}{RC}} = U \cdot e^{-\frac{20}{10}} - U \cdot e^{-\frac{(20-10)}{10}}$

$= U \cdot e^{-2} - U \cdot e^{-1} = U(0{,}15 - 0{,}37)$

$U_e(t) = -2{,}2V$