

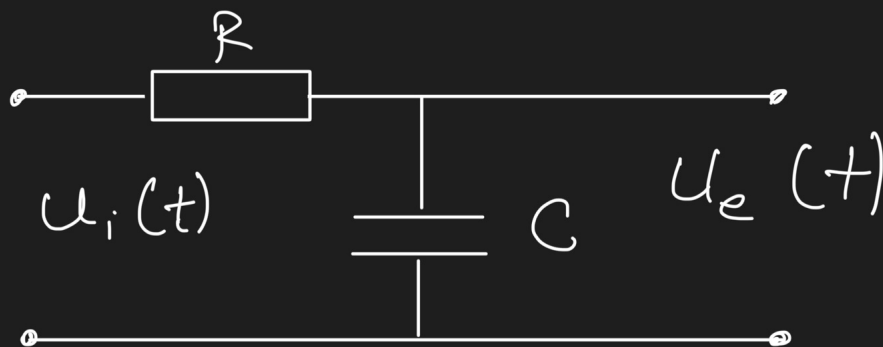
Circuite Limiare RC Trece-Jos

(1) Scopul lucrării

Se va studia experimental trecerea semnalelor de diferite forme: (prin circuitele RC Trece-Jos)

- sinusoidale
- rectangulare
- exponențiale

(2) Circuite RC Trece-Jos



Circuitul de mai sus are proprietatea de a avea atenuarea A în funcție de frecvența semnalului de intrare.

Dacă semnalul aplicat circuitului este unul nesinusoidal, componentele sale de frecvență joasă vor ieși cu o atenuare mai mică decât componentele de frecvență mare.

(2.1.1) Semnalul de intrare sinusoidal de frecvență f

→ atenuat

→ defazat

$$A(\omega) = \frac{1}{\sqrt{1 + (\omega RC)^2}}$$

$$A = \frac{U_e}{U_i}$$

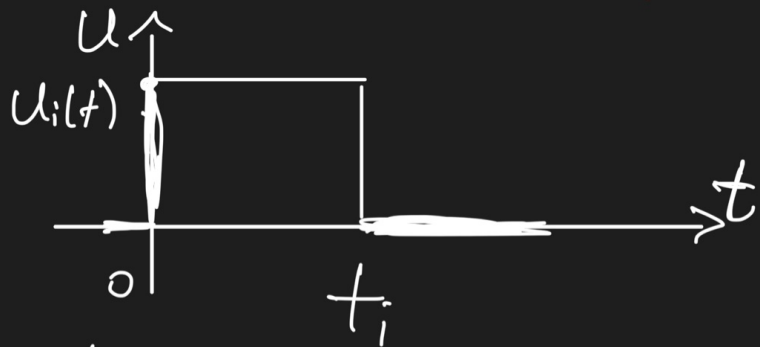
$$\varphi(\omega) = -\arctan(\omega RC)$$

$$\omega = 2\pi f$$

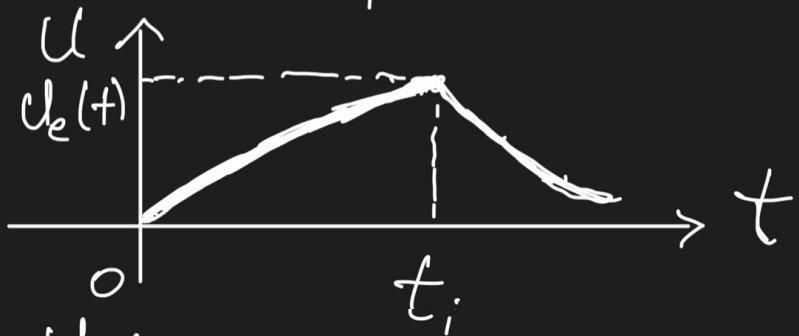
$$\varphi = \frac{f \cdot 360^\circ}{T}$$

(2.1.2) Semnalul de intrare impuls

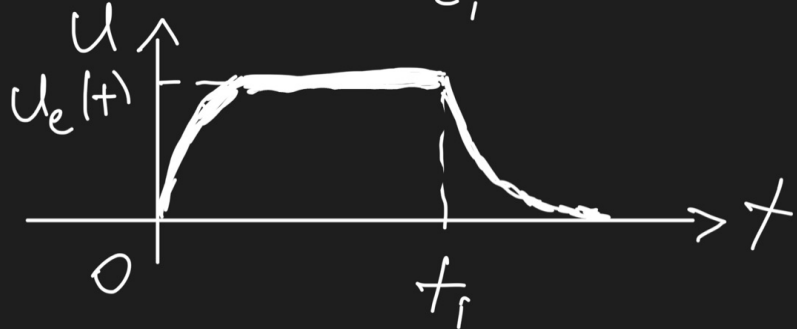
$$RC = t_i$$



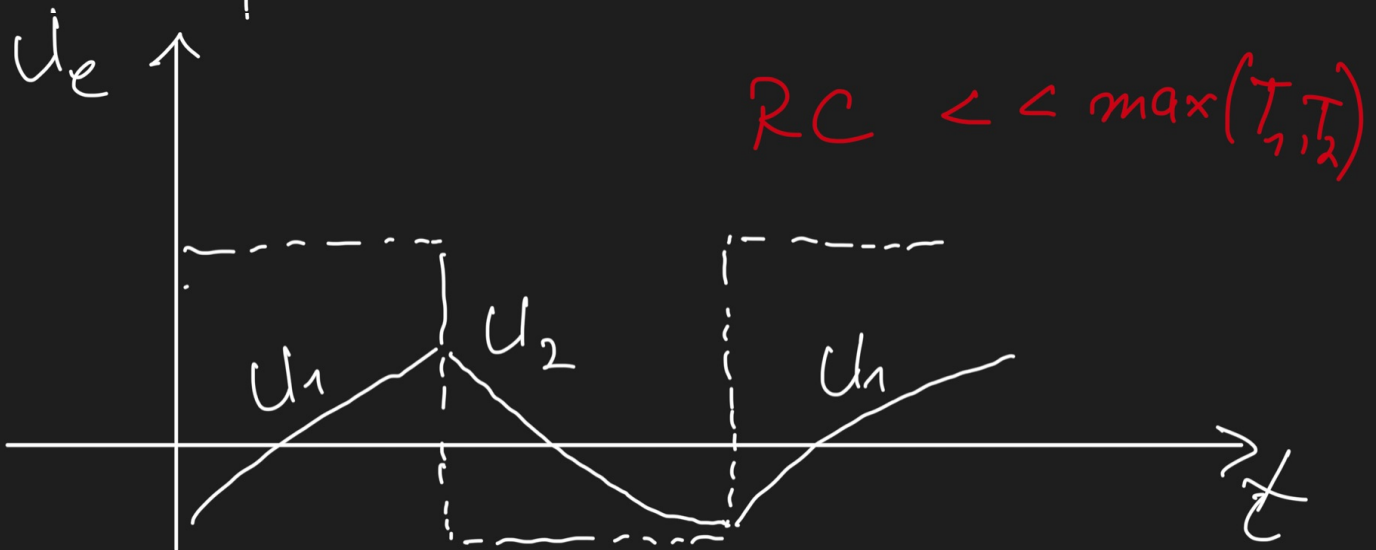
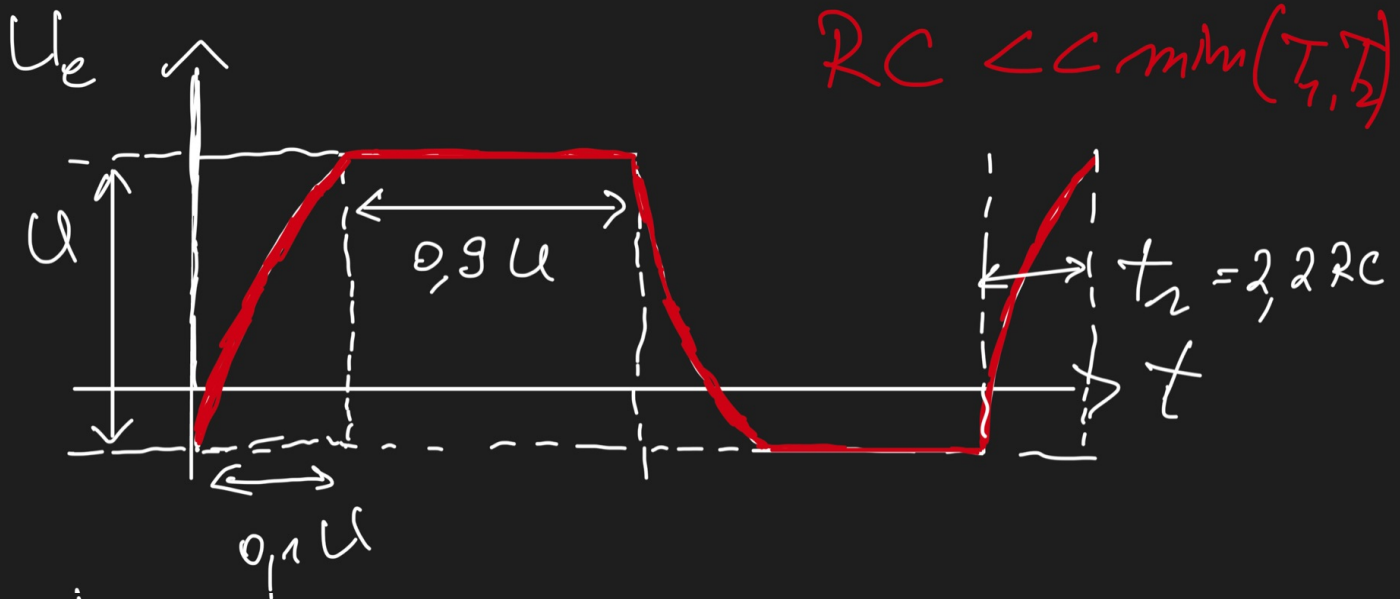
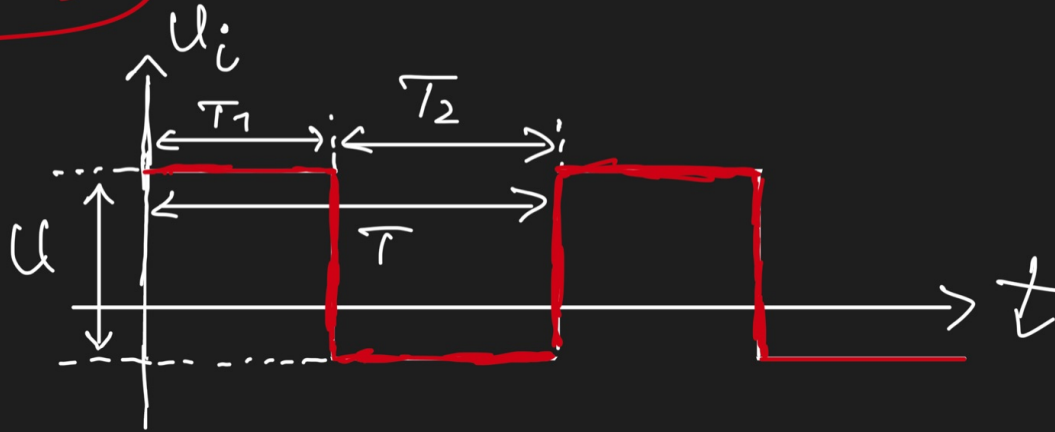
$$RC > t_i$$



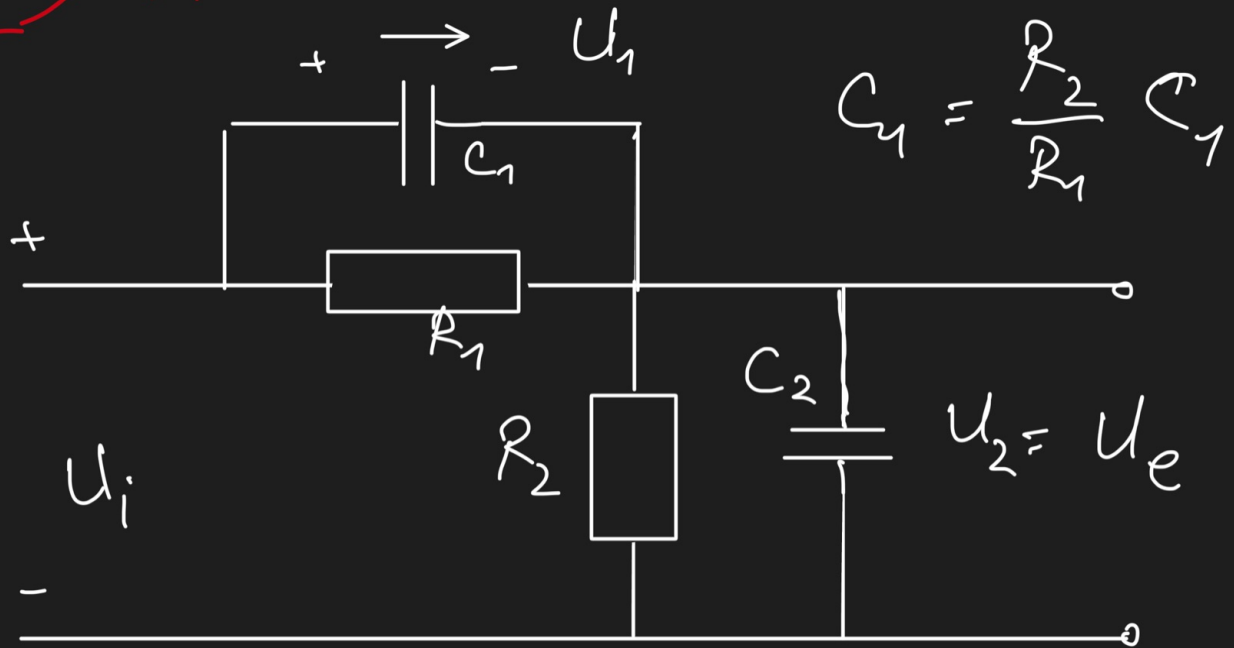
$$RC < t_i$$



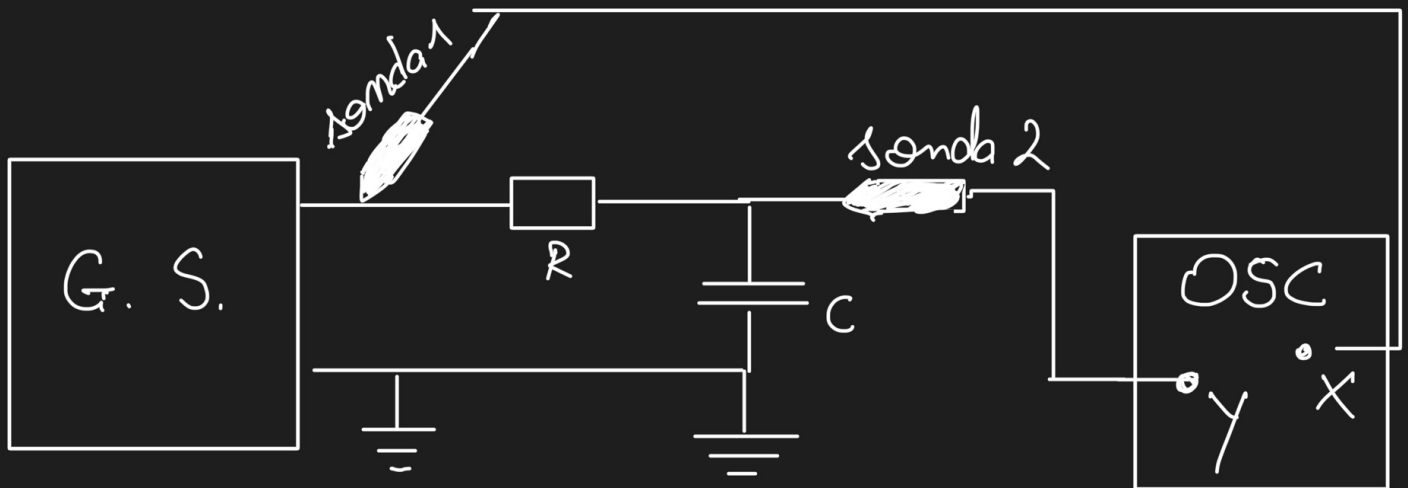
2.1.3 Semnalul de intrare rectangular



(2.3) Atenuatoare RC



(3) Mensur lucrării



3.1.1 Semnal de intrare sinusoidal

$$R = 12 \text{ k}\Omega$$

$$A = 5 \text{ V}$$

$$C = 470 \text{ pF}$$

$$\begin{cases} f_1 = 4 \times 10^3 \text{ Hz} \\ f_2 = 4 \times 10^4 \text{ Hz} \\ f_3 = 4 \times 10^5 \text{ Hz} \end{cases}$$

$$a) \begin{cases} f = ? \\ \text{Atenuarea} = ? \end{cases}$$

$$b) \text{ Oscilograma}$$

U_i intrare
 U_e ieșire

$$c) U_1, U_2 \text{ p.t.}$$

$f = f_2; f = f_3$

3.1.2 Semnal de intrare rectangular

$$R = 10 \text{ k}\Omega$$

$$C = 470 \text{ pF}$$

$$\begin{cases} f_1 = 4 \cdot 10^3 \text{ Hz} \\ f_2 = 4 \cdot 10^4 \text{ Hz} \\ f_3 = 4 \cdot 10^5 \text{ Hz} \end{cases}$$

$$a) \text{ Oscilografarea}$$

p.t. f_1, f_2, f_3

$$b) t_2 = ? \quad f = f_1$$

$$c) U_1, U_2 \text{ p.t.}$$

$f = f_3; f = f_4$

3.2 Atenuatoare RC

$$R_1 = R_2 = 12 \text{ k}\Omega$$

$$C_2 = 470 \text{ pF}$$

$$C_1 = \begin{cases} 0 \\ 220 \text{ pF} \\ 470 \text{ pF} \\ 1,5 \text{ nF} (1500 \text{ pF}) \end{cases}$$

a) Distribuția

b) Amplitudinea
la $t=0$, $t=t_i$

c) Const. de timp τ
pt. capacit.

semnal rectangular $f = 2 \times 10^3 \text{ Hz}$