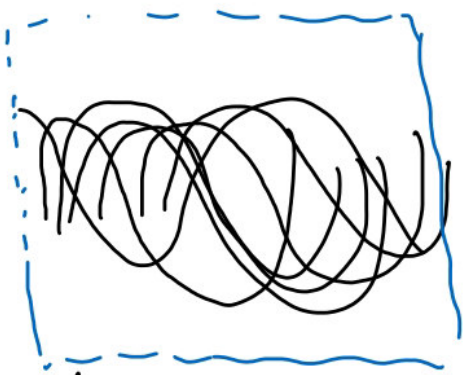
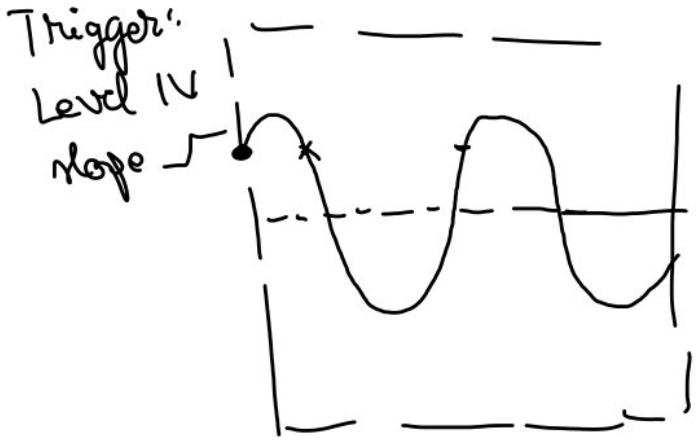
semnal sinusoidal. $A = 2V$



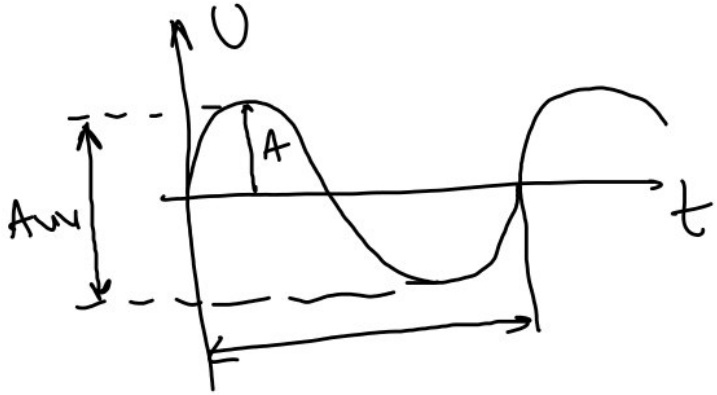
fără trigger

→ (osciloscop nesincronizat



Semnale în electronică:

- tensiune variabilă în timp.



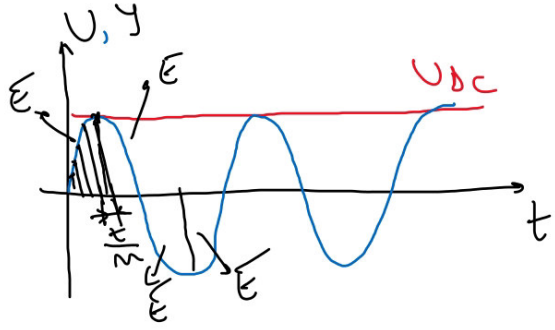
Amplitudinea A - (peak value
max value)

AW - amplit. vârf - la - vârf

RMS (Root Mean Square)

↳ val. efectivă:

perioada $T \Rightarrow$ frecv. $f = \frac{1}{T}$

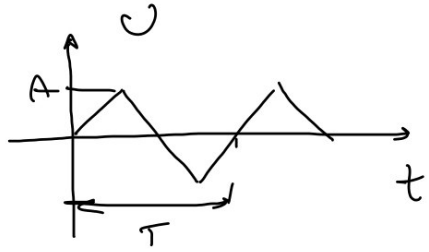


$U_{DC} = R \cdot I_{DC} \Rightarrow P = U_{DC} \cdot I_{DC} \Rightarrow E = P_{DC} \cdot t$

U_{RMS} depinde de forma semnalului:

semnal sinusoidal

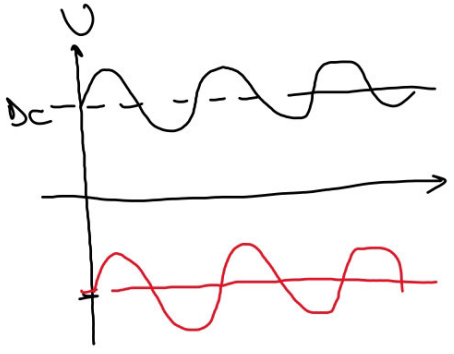
$$U_{RMS} = \frac{A}{\sqrt{2}}$$



semnal triunghiular

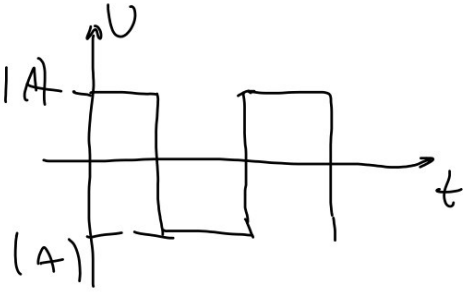
$$U_{RMS} = \frac{A}{\sqrt{3}}$$

DC offset (DC shift)



$$U_{RMS} = U_{DC} + \frac{A}{\sqrt{2}}$$

semnal dreptunghiular

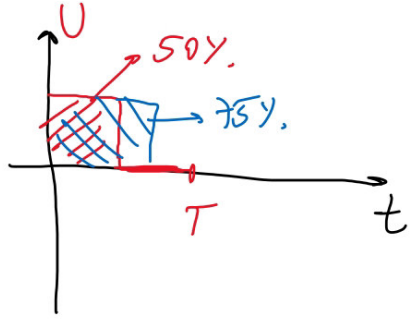


$$U_{RMS} = A$$

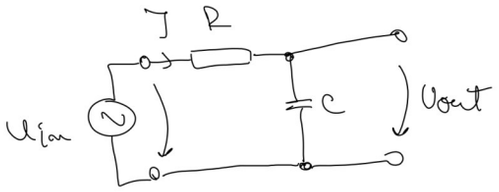
Duty cycle

variază între 0 și A

$$U_{RMS} = \text{duty cycle} \cdot A$$



Studiul unui filtru trece-jos RC:



Funcția de transfer

$$\left|\frac{U_{out}}{U_{in}}\right| = \left|\frac{A_{out}}{A_{in}}\right| = ?$$

Defazajul $\Delta\phi = \phi_{out} - \phi_{in} = ?$

$$Z_C = -\frac{j}{2\pi f C}$$

$$\frac{1}{j} = \frac{j^2}{j} = j$$

$$U_{in} = I \cdot (R + Z_C)$$

$$U_{out} = I \cdot Z_C$$

$$\frac{U_{out}}{U_{in}} = \frac{I Z_C}{I(R+Z_C)} = \frac{Z_C}{Z_C\left(\frac{R}{Z_C}+1\right)} =$$

$$= \frac{1}{1+\frac{R}{Z_C}} = \frac{1}{1-\frac{R}{\frac{j}{2\pi f C}}} =$$

$$= \frac{1}{1-2\pi f R C \cdot j} = \frac{1}{1+j\cdot 2\pi f RC}$$

$$\left|\frac{U_{out}}{U_{in}}\right| = \left|\frac{1}{1+j\cdot 2\pi f RC}\right| = \frac{1}{|1+j\cdot 2\pi f RC|} = \frac{1}{\sqrt{1+4\pi^2 R^2 C^2 f^2}}$$

$$1 + 4\pi^2 R^2 C^2 f_T^2 = 2$$

$$4\pi^2 R^2 C^2 f_T^2 = 1$$

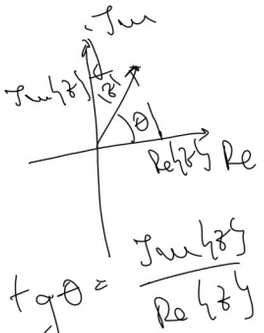
$$f = f_T$$

$$f_T^2 = \frac{1}{4\pi^2 R^2 C^2}$$

$$\left|\frac{U_{out}}{U_{in}}\right| = \frac{1}{\sqrt{2}}$$

$$f_T = \frac{1}{2\pi RC}$$

$$\frac{1}{\sqrt{1+4\pi^2 R^2 C^2 f_T^2}} = \frac{1}{\sqrt{2}}$$



$$\frac{z_2}{z_1} = \frac{|z_2| e^{j\theta_2}}{|z_1| e^{j\theta_1}} = \frac{|z_2|}{|z_1|} \cdot e^{j(\theta_2 - \theta_1)}$$

$$\Delta\phi$$

$$tg\theta = \frac{Im}{Re}$$

$$\theta = \operatorname{arctg}\frac{Im}{Re}$$

$$\Delta\phi = 0 - \operatorname{arctg} 2\pi f RC$$

$$\Delta\phi = -\operatorname{arctg} 2\pi f RC$$

$$\left|\frac{U_{out}}{U_{in}}\right| = \frac{1}{\sqrt{1+\left(\frac{f}{f_T}\right)^2}}$$

$$\Delta\varphi = -\operatorname{arctg}\cdot\frac{f}{f_T}$$

decibelul:

- nivelul unui semnal

amplificare +dB
atenuare −dB

$$n[dB] = 10\log_{10}\frac{P_{out}}{P_{in}} = 10\log_{10}\frac{U_{out}^2/R}{U_{in}^2/R} = 20\log_{10}\frac{U_{out}}{U_{in}}$$

$U_{out} = U_{in} \rightarrow 0\,dB$ (nici atenuare, nici amplificare).

$U_{out} = 2U_{in} \rightarrow n = 20\log_{10}\frac{2U_{in}}{U_{in}} = 0.3\cdot 20 = +6\,dB$ (amplificare)

$U_{out} = 0.5U_{in} \rightarrow n = 20\log_{10}\frac{0.5U_{in}}{U_{in}} = -6\,dB$ (atenuare)

Frecvență de tăiere:

val. lui f pt. care $\left|\frac{U_{out}}{U_{in}}\right| = \frac{1}{\sqrt{2}} = -3\,dB$

$$\frac{A_{out}}{A_{in}} = \frac{1}{\sqrt{2}}$$

$$20\log_{10}\cdot\frac{A_{out}}{A_{in}} = -3$$

$$\log_{10}\frac{A_{out}}{A_{in}} = -\frac{3}{20}$$

$$\frac{A_{out}}{A_{in}} = 10^{-\frac{3}{20}} = 0.707$$

$$A_{out} = A_{in}\cdot 0.707 = \frac{A_{in}}{\sqrt{2}}$$