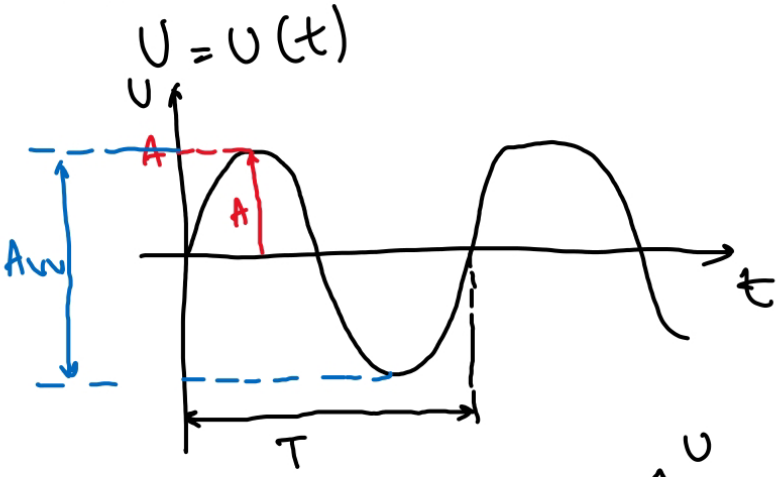
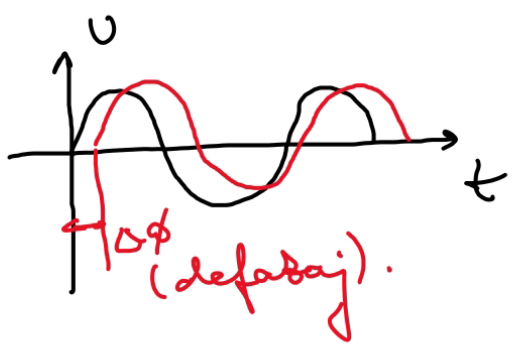
Semnale în electronică:



Amplitudine A (peak value)

Amplitudine vârf-la-vârf, Avv.
(peak-to-peak)

Perioada, T ⇒ Frecvența f



Valoare medie sinus = 0.

Valoare efectivă (RMS), root mean square.

RMS - echivalentul DC al semnalului care produce aceeași energie (încălzire)

RMS - depinde de forma semnalului.

220V → U_{RMS}

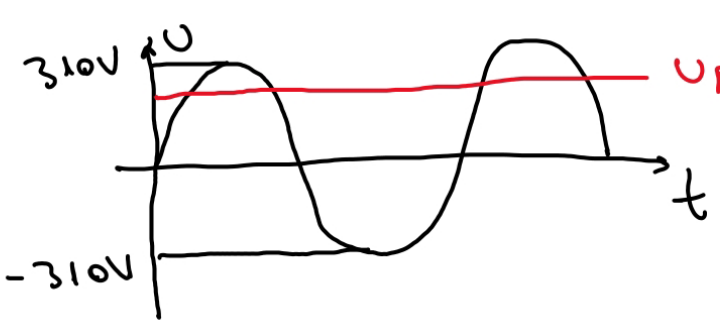
50Hz

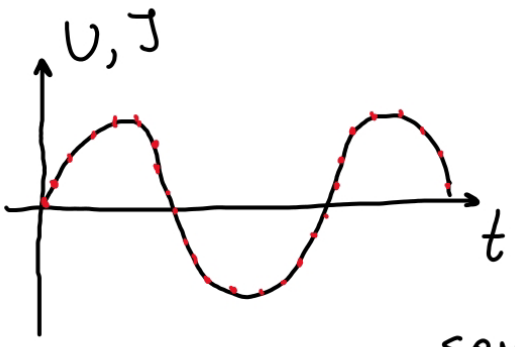
sin

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

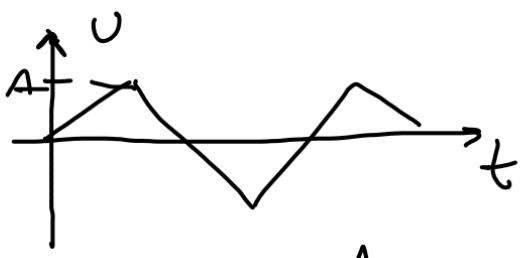
$\Rightarrow A = U_{RMS} \cdot \sqrt{2} = 310V$

La priză:





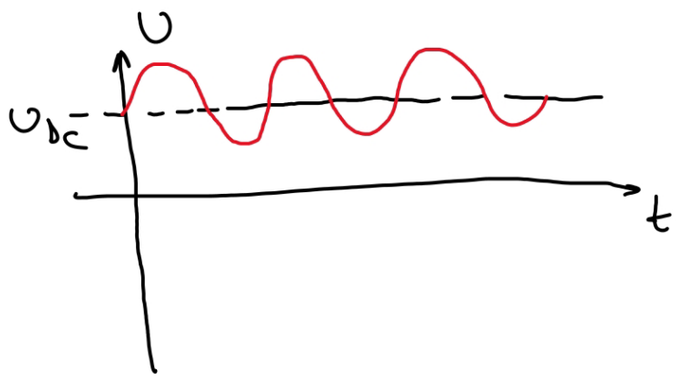
semnal triunghiular:



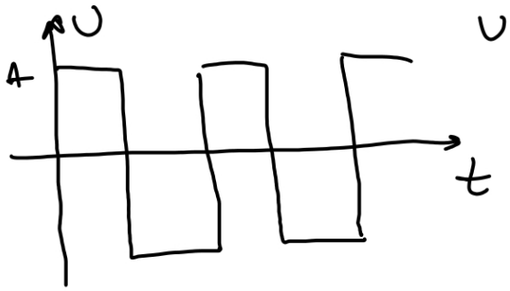
$U_{RMS} = \frac{A}{\sqrt{3}}$

"DC offset"

$U_{Gen} = U_{sin} + U_{DC}$



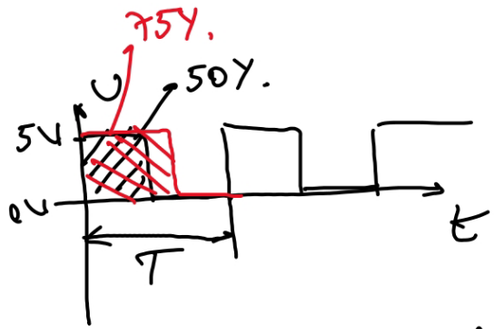
Semnal dreptunghiular:



$U_{RMS} = A$

Generator de semnal:

$A_{UV} = 2A$!!!

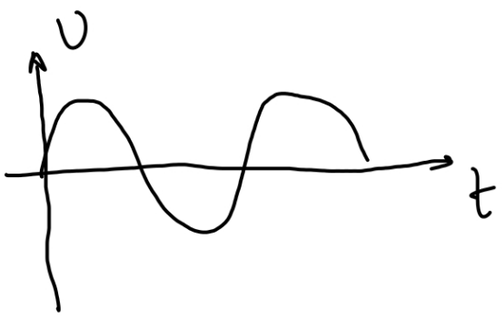


Duty cycle:

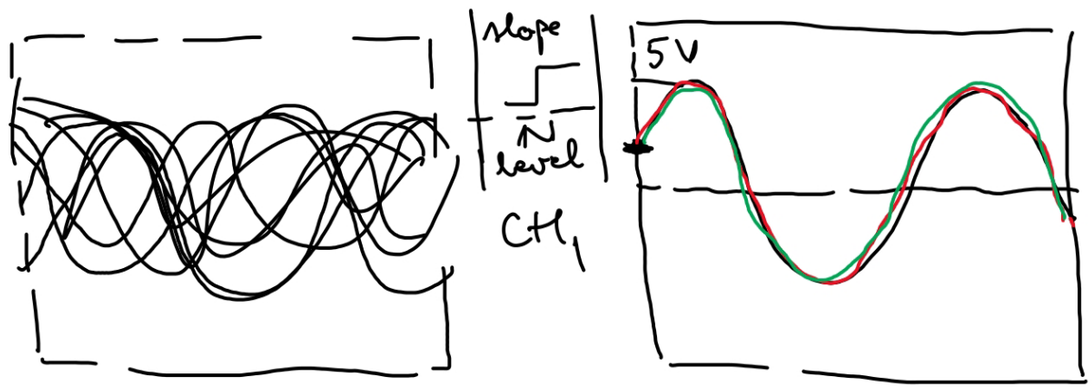
digital 0,1 → 0V, 5V

Arduino PWM → duty cycle $^{0-255}_{(0\%)-(100\%)}$

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



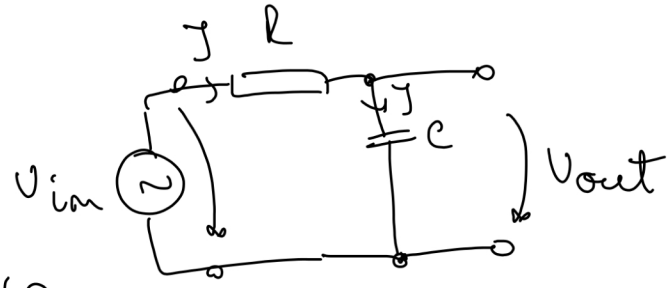
trigger



untriggered

(nesincronizat)

Filtrul trece-jos RC:



$f \neq 0$

Funcția de transfer

$$\left|\frac{V_{out}}{V_{in}}\right| = \frac{A_{out}}{A_{in}} = \frac{A_{out}^{vv}}{A_{in}^{vv}} = \frac{A_{out}^{RMS}}{A_{in}^{RMS}} = f(\nu)$$

Defazajul

$$\Delta\phi = \phi_{out} - \phi_{in} = f(\nu)$$

$C \rightarrow Z_C = -\frac{j}{2\pi f C}$) f - frecv., ν - frecv.

$$\left.\begin{aligned} V_{in} &= I(R + Z_C) \\ V_{out} &= I \cdot Z_C \end{aligned}\right\} \rightarrow \frac{V_{out}}{V_{in}} = \frac{I Z_C}{I(R+Z_C)} = \frac{Z_C}{Z_C\left(1+\frac{R}{Z_C}\right)} =$$

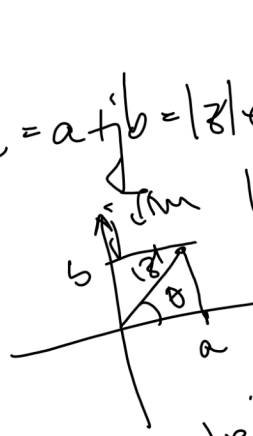
$$= \frac{1}{1 - \frac{R}{\frac{j}{\omega C}}} = \qquad -\frac{1}{j} = \frac{j \cdot K}{j} = j$$

$$= \frac{1}{1 + j \cdot 2 \cdot 2\pi f C} = \frac{V_{out}}{V_{in}}$$

$z = a + jb = |z| e^{j\theta}$

$|z| = \sqrt{a^2 + b^2}$

$\operatorname{tg}\theta = \frac{b}{a} = \frac{Im}{Re}$



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

$$\left|\frac{V_{out}}{V_{in}}\right| = \frac{1}{|1 + j2\pi f RC|} = \frac{1}{\sqrt{1 + 4\pi^2 f^2 R^2 C^2}} = \frac{1}{\sqrt{1 + \left(\frac{f}{f_T}\right)^2}}$$

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

Decibel:

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

$V_{out} = V_{in} \Rightarrow n = 20 \log_{10} 1 = 0$ dB (nici amplif., nici atenuare)

$V_{out} = 2V_{in} \Rightarrow n = 20 \log_{10} 2 = +6.02$ dB (amplificare)

$V_{out} = \frac{V_{in}}{2} \Rightarrow n = 20 \log_{10} 0.5 = -6.02$ dB (atenuare)

Frecventa de taiere: $f_T \Rightarrow n = -3$dB.

$$f = f_T \Rightarrow \left|\frac{V_{out}}{V_{in}}\right| = \frac{1}{\sqrt{1 + 2\pi f_T^2 R^2 C^2}} = \frac{1}{\sqrt{2}}$$

$$20 \log_{10} \left|\frac{V_{out}}{V_{in}}\right| = -3 \qquad \left|\frac{V_{out}}{V_{in}}\right| = 10^{-\frac{3}{20}} = 0.707$$

$V_{out} = V_{in} \cdot 0.707$

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

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

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