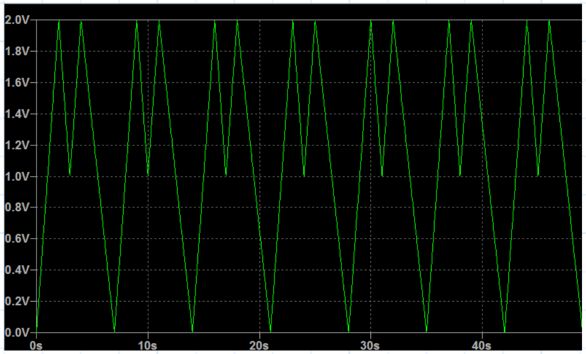
Circuit Analysis using Laplace Transform



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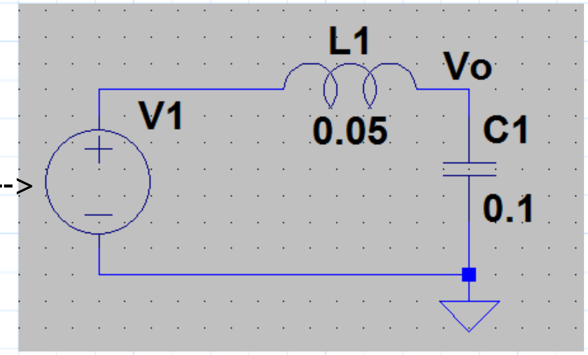


$u := \Phi$ “<—— For piecewise functions must be used heaviside”

$p := 7$ “<—— Signal period”

$n := 50$ “<—— Number of periods”

$i := 0, p .. n \cdot p$ “<—— Iteration”

$a(t) := t \cdot (u(t) - u(t-2))$ “<——First signals interval”

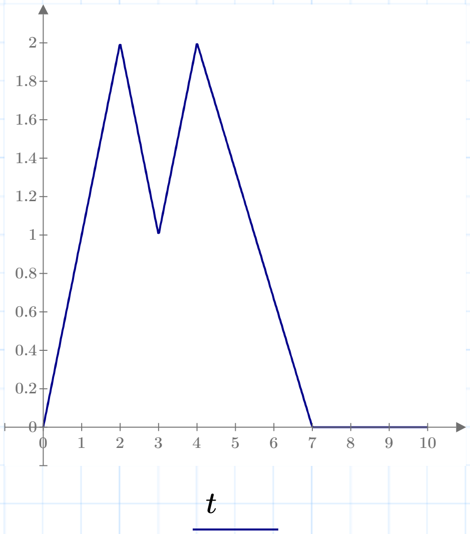
$b(t) := (t-4) \cdot (u(t-2) - u(t-3))$ “<——Second signals interval”

$c(t) := (t-2) \cdot (u(t-3) - u(t-4))$ “<——Third signals interval”

$d(t) := \frac{2}{3}(t-7) \cdot (u(t-4) - u(t-7))$ “<——Fourth signals interval”

$f(t) := a(t) - b(t) + c(t) - d(t)$ “<—— Signal”

$$f(t) := t \cdot (u(t) - u(t-2)) - (t-4) \cdot (u(t-2) - u(t-3)) + (t-2) \cdot (u(t-3) - u(t-4)) - \frac{2}{3}(t-7) \cdot (u(t-4) - u(t-7))$$



"Here i tried to make an incremented f(t):"

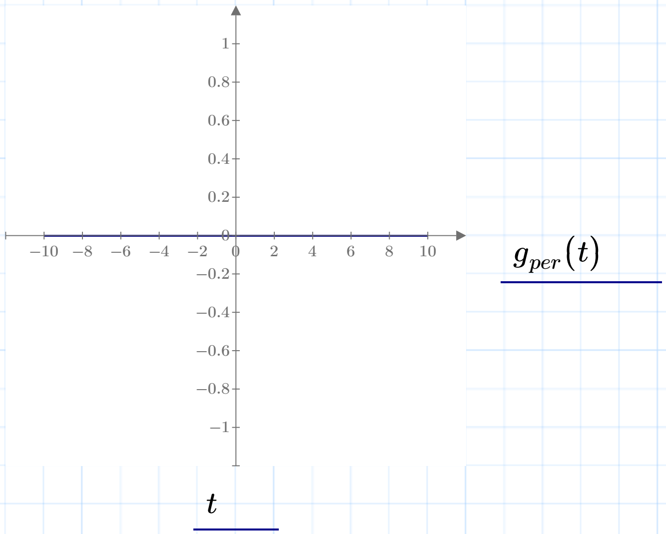
$$f_i(t) := t \cdot (u(t-i) - u(t-i-2)) - (t-4) \cdot (u(t-i-2) - u(t-i-3)) + (t-2) \cdot (u(t-i-3) - u(t-i-4)) - \frac{2}{3}(t-7) \cdot (u(t-i-4) - u(t-i-7))$$

"Here is two periodic forms of f(t) and it works:"

$$f_{per\_m}(t) := f(\mathrm{mod}(\mathrm{mod}(t, p) + p, p))$$

$$f_{per\_f}(t) := f\left(t - p \cdot \mathrm{floor}\left(\frac{t}{p}\right)\right)$$

$$g_{per}(t) := \text{for } t \in 0 .. p \quad \| f_{per\_f}(t)$$



"Apply Laplace transform to f(t):"

$$f(s) := f(t) \xrightarrow{laplace} \frac{6 \cdot \left(e^{-2 \cdot s}\right)^{\frac{3}{2}} - 5 \cdot e^{-4 \cdot s} - 6 \cdot e^{-2 \cdot s} + 2 \cdot \left(e^{-2 \cdot s}\right)^{\frac{7}{2}} + 3}{3 \cdot s^2}$$

"Components values:"

$$C := \frac{1}{10} \qquad L := \frac{1}{20}$$

$$num(s) := \frac{1}{(C \cdot s)} \qquad den(s) := \frac{1}{(C \cdot s)} + L \cdot s$$

$$V_o(s) := f(s) \cdot \frac{num(s)}{den(s)}$$

"<—— The output voltage from a voltage divider"

"Apply invLaplace transform to Vo(s):"

$$V_o(t) := V_o(s) \xrightarrow{invlaplace} t + \frac{\Phi(t-2) \cdot \left(\frac{3 \cdot \sqrt{2} \cdot \sin\left(\sqrt{2} \cdot (10 \cdot t - 20)\right)}{10} - 6 \cdot t + 12\right)}{3} - \frac{\Phi(t-3) \cdot \left(\frac{3 \cdot \cdots}{\cdots}\right.}{\cdots} \ldots$$