

rechnung_betragundphase_umkehrintegrator

Student Group

First Name	Surname	Matrikel Nr.

Table of Contents

\$\;\$ \$\;\$	$U_A = -\frac{1}{R \cdot C} \int \int U_E(t) dt + U_{A0}$
\$\;\$ \$\;\$ insert sine function: \$ \$\color{blue}\{U_E(t)\}=\$ \$\hat{U}_E \cdot \sin(\omega \cdot t)\$	
	$U_A = -\frac{1}{R \cdot C} \int \int \color{blue}\{\int_{t_0}^{t_1} \hat{U}_E \cdot \sin(\omega \cdot t) dt\} + U_{A0}$
\$\;\$ \$\;\$ insert root function with limits \$ \$\color{blue}\{\int_{x_0}^{x_1} \sin(a \cdot x) dx\} = [-\frac{1}{a} \cdot \cos(a \cdot x)]_{x_0}^{x_1}\$	
	$U_A = -\frac{1}{R \cdot C} \int \int \color{blue}\{-\frac{\hat{U}_E}{\omega} \cdot \cos(\omega \cdot t)\}_{t_0}^{t_1} + U_{A0}$
\$\;\$ \$\;\$ put constant before integral	
	$U_A = \frac{1}{R \cdot C} \int \int \color{blue}\{\cos(\omega \cdot t)\}_{t_0}^{t_1} + U_{A0}$
\$\;\$ \$\;\$ insert limits: \$t_0=0\$, \$t_1=t\$	
	$U_A = \frac{\hat{U}_E}{\omega \cdot R \cdot C} \int \int (\cos(\omega \cdot t) - \color{blue}\{\cos(0)\}) + U_{A0}$
\$\;\$ \$\;\$	$\color{blue}\{\cos(0)\} = 1$
	$U_A = \frac{\hat{U}_E}{\omega \cdot R \cdot C} \int \int (\cos(\omega \cdot t) - 1) + U_{A0}$
\$\;\$ \$\;\$ multiply	
	$U_A = \frac{\hat{U}_E}{\omega \cdot R \cdot C} \int \int \color{blue}\{-\frac{\hat{U}_E}{\omega \cdot R \cdot C}\} + U_{A0}$
\$\;\$ \$\;\$ consider the non-cosine terms	
	$U_A = \frac{\hat{U}_E}{\omega \cdot R \cdot C} \int \int \color{blue}\{-\frac{\hat{U}_E}{\omega \cdot R \cdot C}\} + U_{A0}$
\$\;\$ \$\;\$ This part is independent in time. Since we assume purely sinusoidal quantities, the initial voltage of the capacitor must be: \$\;\$ \$U_{C0} = U_{A0} = \frac{\hat{U}_E}{\omega \cdot R \cdot C}\$	
	$U_A = \frac{\hat{U}_E}{\omega \cdot R \cdot C} \int \int \color{blue}\{\cos(\omega \cdot t)\}$

From: <https://wiki.mexle.org/> - MEXLE Wiki

Permanent link: https://wiki.mexle.org/circuit_design/rechnung_betragundphase_umkehrintegrator?rev=1641770218

Last update: 2022/01/10 00:16

